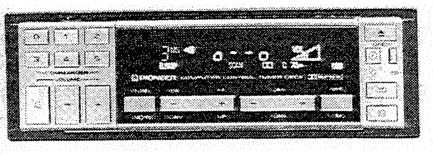
PIONEER

Service Manual



ORDER NO.
CRT-437-0

CENTRATE CAR AUDIO SYSTEM
CASSETTE CAR STEREO WITH FM/AM ELECTRONIC TUNER

FEX-90 ES

SPECIFICATIONS

General

Power source	DC14.4V (10.8 ~ 15.6V allowable)
Grounding system	Negative type
Dimensions (Controller)	180(W)×50(H)×165(D)mm
(Tuner Unit)	180(W)×25(H)×150(D)mm
Weight (Controller)	2.3kg
(Tuner Unit)	0.6kg
Tone controls (bass)	±10 dB (100Hz)
(treble)	±10 dB (10kHz)
Maximum output level	200mV
Output impedance	1kΩ

Tape player

Tape	Compact cassette tape (C-30 ~ C-90)
Tape speed	4.76 cm/sec. (+0.14 cm/sec., −0.05 cm/sec.)
Fast forward/rewind time	Approx. 100 sec. for C-60
Wow & flutter	0.07% (WRMS)
Frequency response	Metal: 30 ~ 20,000Hz (±3 dB)
	Normal: 30 ~ 16,000Hz (±3 dB)
Stereo separation	45 dB
Signal-to-noise ratio	Dolby C-type NR IN: 70 dB (IEC-A network)
	Dolby B-type NR IN: 63 dB (IEC-A network)
	Dolby NR OUT: 55 dB (IEC-A network)

FM tuner

Frequency range	87.5 ~ 108MHz
Usable sensitivity	12 dBf (1.1μV/75Ω, mono)
50 dB quieting sensitivity	17 dBf (1.9μV/75Ω, mono)
Signal-to-noise ratio	70 dB (IEC-A network)
Distortion	0.3% (at 65 dBf, 1kHz, stereo)
Frequency response	30 ~ 15,000Hz (±3 dB)
Stereo separation	40 dB (at 65 dBf, 1kHz)

AM tuner

Frequency range	531 ~ 1,602kHz
Usable sensitivity	19μV (25 dB) (S/N: 20 dB)
Selectivity	50 dB (±9kHz)

Note:
Specifications and the design are subject to possible modification without notice due to improvements.

- Dolby and the double-D symbol are trademarks of Dolby Laboratories Licensing Corporation.
- Noise Reduction System manufactured under license from Dolby Laboratories Licensing Corporation.

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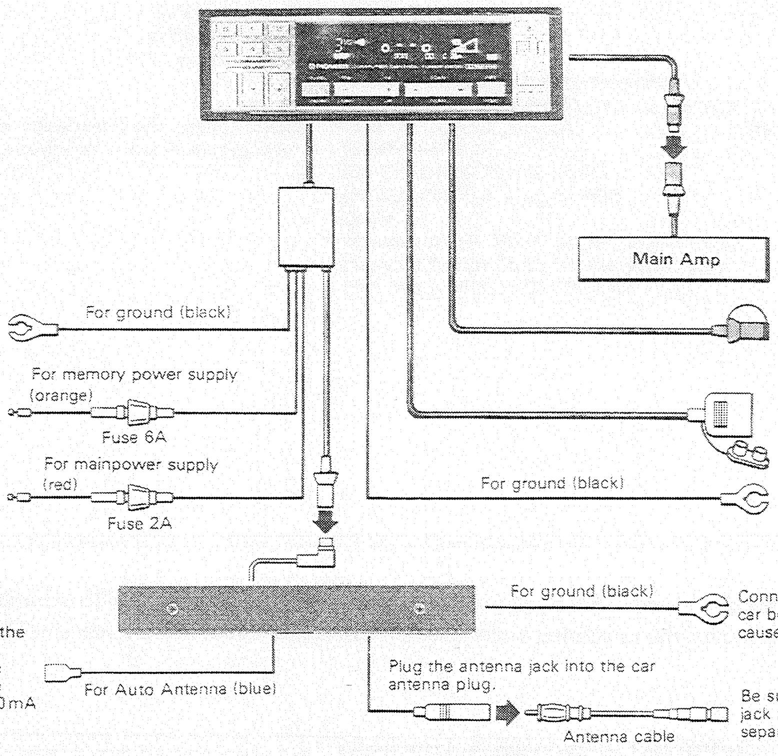
1. CONNECTING the UNITS



Connect to a metal part of the car body.

Connect to the positive terminal of battery which supplys 6A current regardless of ignition key position.

Connect the main power supply only after every other connection has been made. This very last connection is made to the accessory connector leading from the car's fuse unit.

Connect to lead wire of relay for the power auto antenna.
The antenna will automatically be raised and lowered by turning the radio switch on and off (Max. 300 mA 12V DC).

External input connector for connection of separately available accessories. If no accessory is connected, cover the connector with a cap.

For connection to the Wireless Remote Control Subcommander, separately available. Cover the connector with a cap if the Wireless Remote Control is not used.

Connect to a metal part of the car body.

Connect firmly to a metal part of the car body. Improper grounding will cause noise from the engine.

Plug the antenna jack into the car antenna plug.

Be sure to use this when the antenna jack and the car antenna plug are separated.

QUESTIONNAIRE

MODEL ____________________
One Model per questionnaire

Dear Servicer,

Thank you for your cooperation in the post-sale service of Pioneer products.

This questionnaire is used as a tool to improve the serviceability of our products and service manuals. Please evaluate this model and service manual by answering the following questions. Your ideas may be realized in our future products. Your answers will be appreciated. Thank you.

PIONEER ELECTRONIC CORP.

T. Nakagawa, Manager, Service Section, International Division

1. SERVICING EVALUATION Circle applicable number:	Good		Fair		Poor
a. Disassembly/Re-assembly:	1	2	3	*4	*5
b. Circuit Checks:	1	2	3	*4	*5
c. Replacement of Parts:	1	2	3	*4	*5
d. Adjustment (s):	1	2	3	*4	*5

* If (4) or (5) was circled, please be specific.

e. Your advice, opinion or ideas related to servicing this product.

---

2. SERVICE MANUAL EVALUATION

a. Circuit & Mechanism Description

b. Circuit Diagram

---

3. OTHER

Please describe other areas of servicing which you may find difficult.

Completed by :

Date :

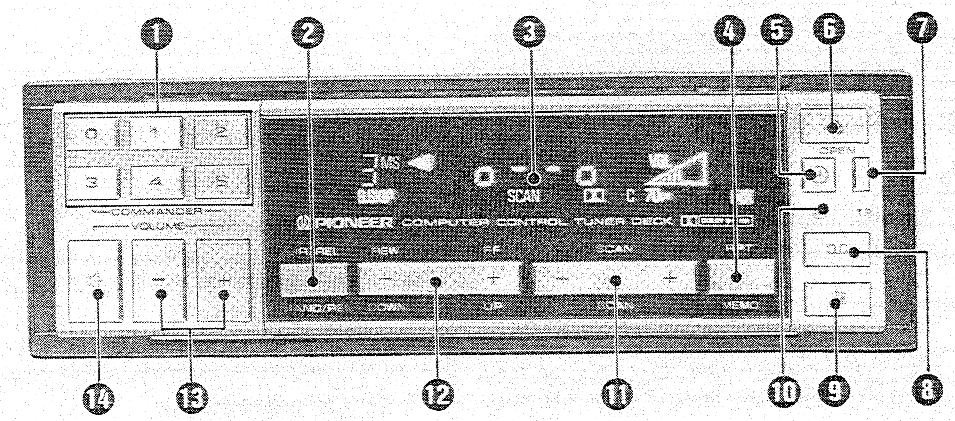
Company Name :

Address :

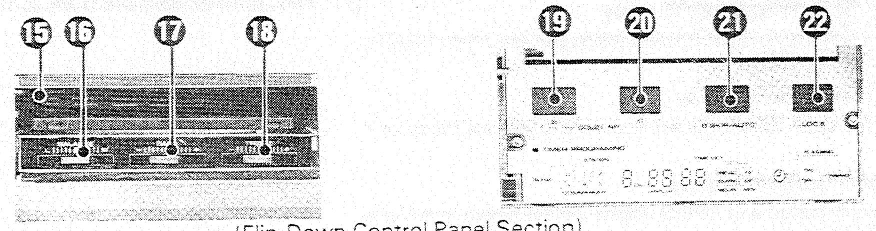
City/State/Zip :

Please send this form filled to the distributor in your country.

2. NOMENCLATURE and USE



(Front section)



(Flip-Down Control Panel Section)

Tape Operation

① Command Button

Press the command button to set the number of recorded selections to be skipped or to set the number of times a piece is to be repeated.

② Program Switching/Release Button

Press this button to switch from side A to side B and vice versa. Also, you can press this button to cancel music scan, search, repeat, skip search, and fast forward or rewind.

③ Display

④ Music Repeat Button

Press this button to hear the piece you are listening to as many times as you wish. Also, with the repeat command set, the piece will play as many times as the number you have set. To cancel music repeat, press the release button or music repeat button one time.

⑤ Clock Button

Press this button to display the time. Press it again and tape running display returns.

⑥ Open/Eject Button

Press this button and the flip-down control panel opens. Press the button once more to eject the cassette.

⑧ Tape Power switch

Press this switch to stop tape playback. The power is turned on when this switch is pressed once again, and the playback will start from the point at which the power was previously turned off. To switch over directly to tuner operation, simply press the Tuner Power switch. Then the unit will automatically switch from tape playback to tuner operation.

⑩ Clear Button

Press this button with a pointed rod if the tape running should by chance malfunction (incorrect display, etc.). After several seconds, tape running will return to normal.

⑪ Music Scan Button

Pressing this button will advance the tape and play the first 10 seconds of the next selection. The tape will then advance to the next selection to play the first 10 seconds. This will continue until the release button is pressed. Pressing the release button during the 10 second periods will return the unit to normal playback mode.

⑫ Fast Forward Button (+)/Rewind Button (−)
Set Minutes Button (+)/Set Hours Button (−)

Press the (+) side for fast forward or the (−) side for rewind. For music search, press this button twice. When setting time, press (+) side for minutes and (−) side for hours. When setting time, press (+) side for minutes and (−) side for hours while the clock button is depressed.

⑬ Volume Increase Button (+)
Volume Decrease Button (−)

Press the (+) side to increase volume (soft → loud) or the (−) side to decrease volume (loud → soft). The button has 31 levels for adjustment. Each time you press the button, the volume level increases or decreases accordingly. Hold the button and the volume will increase or decrease continuously.

⑭ Attenuator Button

Press this button and volume level decreases instantaneously to 1/10 of the original volume. Press the button again and volume returns to the original level.

⑮ Cassette Insert Slot

Insert the tape side of a cassette into the slot and the deck will set the cassette automatically. At this time, the tape running display above the tape is always (◀) which indicates normal direction.

⑯ Balance Control

⑰ Bass Control

⑱ Treble Control

⑲ Dolby B-type NR Button

Press this button to play a tape recorded on a Dolby B-type NR system. (▯▯B will light up on the display.)

⑳ Dolby C-type NR Button

Press this button to play a tape recorded on a Dolby C-type NR system. (▯▯C will light up on the display.)

㉑ Blank Skip Button

Press this button (B.SKIP will light up on the display) and the blank between recorded sections (more than 12 seconds) will be skipped automatically to let the next selection play.

- All the press type control buttons have an electronic sound (beep) and display for dual checking to confirm operation.
- Noise reduction manufactured under license from Dolby Laboratories Licensing Corporation. "Dolby" and the double-D symbol are trade marks of Dolby Laboratories Licensing Corporation.

Tuner Operation

① Station Preset Button

If you use this button to set FM/AM station frequencies in memory, you can preset and recall up to 12 FM (6 on FM1 and 6 on FM2) and 6 AM stations. Press the button to recall one of the 18 preset stations.

② Band Switching/Release Button

Pressing this button will switch to the next band in the following order: FM1 → FM2 → AM → FM1. This button also works to cancel a seek tune frequency.

③ Display

④ Memory Button

⑦ Program Timer Button

Press this button to set the timer for a program, or to cancel a presetting of the timer. Two programs can be set with the timer.

⑨ Tuner Power Switch

Press this button to turn on power to the tuner control section. Press the button again to turn power off.
Also, when you want to listen to a tape, press the tape power switch directly and tape play will be selected instead of the tuner.

⑩ Clear Button

If something goes wrong (display is incorrect, etc.) while you are listening, press this button with a pointed rod. After several seconds, operation will return to normal. Remember that when you press this button, all preset frequencies entered into memory are erased and programmed function settings are cleared so you should make settings again as desired.

⑪ Seek Button

Pressing the (+) side of this button automatically advances the tuning to the next higher frequency, while pressing the (−) side tunes to the next lower frequency.

⑫ Tuning Button

Press the (+) side (low → high) or the (−) side (high → low) to adjust the station frequency setting.

㉑ Auto/Mono Switching Button

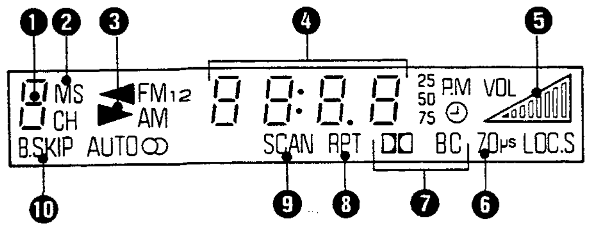
This button functions during FM broadcasts. Generally this button is pressed and left in the AUTO setting. (Note: The word AUTO is illuminated on the display in this setting.) In this position the unit will automatically switch to high quality stereo when a strong signal is present, and to the optimal reception condition should the signal weaken or to monoaural when a very weak signal is present.
Pressing the button once more (Note: the illuminated AUTO will disappear from the display) will allow reception of frequencies regardless of their strength, in monoaural.

㉒ Local Station Button

Use this button to change the seek threshold level of the SEEK function. Normally, this button is kept in the OFF position. At night, when radio signal conditions are favorable, very weak signals are often detected and sought out by the SEEK function. Pressing this button (Note: LOC.S will illuminate on the display) will raise the seek threshold level to eliminate this problem.

- All the press type control buttons have an electronic sound (beep) and display for dual checking to confirm operation.
- The tuner may not function properly when using it for the first time. In such a case, press the Clear button. The tuner will then return to normal operation after a few seconds.
- If a cassette tape is set while listening to either AM or FM broadcast, sound will automatically be switched from the tuner to the tape.
- SEEK operations of the tuner and SCAN operations of the deck share the same button. Therefore, though the display shows the word SCAN, the SEEK function is actually being performed.

3. READING the DISPLAYS



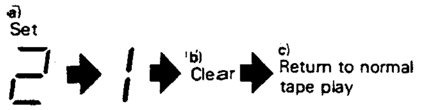
When Playing Tapes

❶ 8 : Number of Times to Skip or Repeat

The number corresponding to the commander button pressed to set the number of recorded sections to skip in skip search or the number of times to replay in music repeat is displayed.

- For music repeat, the number of repeats is set and the display changes as shown in the following figure.

Example: Set repeat for 2 times

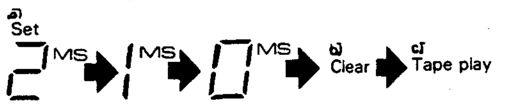


❷ MS : Skip Search/Music Search Display

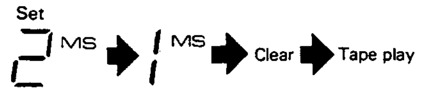
MS display flashes when skip search or music search is operating.

- For skip search, the display changes as shown in the following figure.

Example: To find the beginning of the second selection before the one being played.

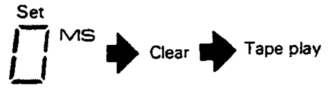


Example: To find the beginning of the second selection following the one being played.

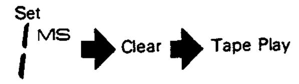


- For music search, the display changes as shown in the follwoing figure.

Find the beginning of the presently playing piece.



Find the beginning of the next piece following the presently playing piece.

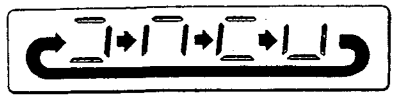


❸ ◀▶ : Tape Play Indication

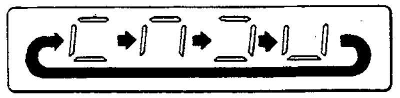
When playing back upper tracks ◀ mark appears and when lower tracks are played back, ▶ mark appears.

❹-1 8 8:8.8 : Tape Play, Fast Forward/Rewind Indication

When the ◀ mark appears, tape travel is in the normal direction (right to left) and the ⌈⌉ mark rolls in the direction shown in the following figure: (counterclockwise)



When the ▶ mark appears, tape travel is in the reverse direction (left to right) and the ⌈⌉ mark rolls in the direction shown in the following figure: (clockwise)



During fast forward and rewind, speed of rotation of the ⌈⌉ mark is faster. During fast forward, the mark rolls in the normal direction. During rewind, the mark rolls in the reverse direction.

❹-2 8 8:8.8 : ATSC (Automatic Tape Slack Canceler) Display

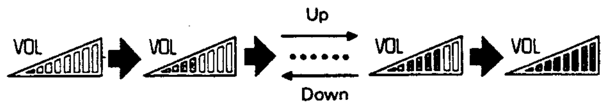
When a cassette is set in the deck, the tape slack is taken up automatically. At this time □ ‾ ‾ □ display flashes.

❹-3 8 8:8.8 : Time Display

Press the clock button and time is displayed.

❺ VOL : Volume Level /Attenuator Display

Press the volume button and volume level is indicated in yellow steps from 1 to 15 and red steps from 16 to 31. Volume level change is indicated as shown in the following figure. The ◢ symbol is always lit.



Press the attenuator button and the entire LED will flash to indicate volume has been reduced to 1/10 of the original level.

❻ 70μs : 70μs Tape Display

Insert a cassette tape and the auto tape selector will automatically switch the equalizer (70μs/120μs). If it is a 70μs tape, the 70μs display will illuminate. If it is a 120μs tape, there is no display.

❼ DD BC : Dolby B and C NR Display

Press B button to listen to a tape recorded on Dolby B-type NR. DD B display will illuminate. You may also press C button to listen to a tape recorded on Dolby C-type NR. DD C display will illuminate.

❽ RPT : Music Repeat Display

Press music repeat button and RPT display will illuminate to indicate the function is operating.

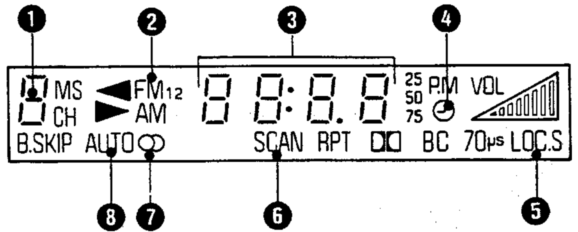
❾ SCAN : Music Scan Display

Press music scan button and SCAN display will illuminate to indicate the function.

❿ B.SKIP : Blank Skip Display

Press blank skip button and B.SKIP display will illuminate to indicate the function.

When Listening to the Tuner.



❶ 8CH : Channel Number Display

Press the station preset button and the number of preset channel is displayed.

❷ FM12 AM : Band Display

Press the band switching release button repeatedly to set bands in the folvtaing sequence. FM1 → FM2 → AM → FM1. To listen to an FM station, set the button for FM1 or FM2. To listen to an AM station, set the button for AM.

❸ 8 8:8.8 25 50 75 : Frequency Display

Turn power on and the frequency band is displayed as 87.5 to 108MHz for FM or 531 to 1,602kHz for AM.

❹ ◷ : Program Timer Display

When setting the timer, ◷ display will illuminate to indicate the timer is operating.

❺ LOC.S : Local Station Display

Press local station button and LOC.S display will illuminate to indicate the function is operating.

❻ SCAN : Seek Display

Pressing the seek button will illuminate SCAN on the display. Though SCAN appears on the display, the SEEK function is actually being performed.

❼ ꝏ : FM Stereo Reception Display

When FM stereo is being received, ꝏ is illuminated.

❽ AUTO : Auto Display

Pressing the auto/mono switching button illuminates AUTO on the display. When pressed one more, it will go out.

4. PARTS LOCATION

NOTE

- *For your Parts Stock Control, the fast moving items are indicated with the marks ★★ and ★.*

  ★★ : GENERALLY MOVES FASTER THAN ★.

  This classification shall be adjusted by each distributor because it depends on model number, temperature, humidity, etc.

● Control Section

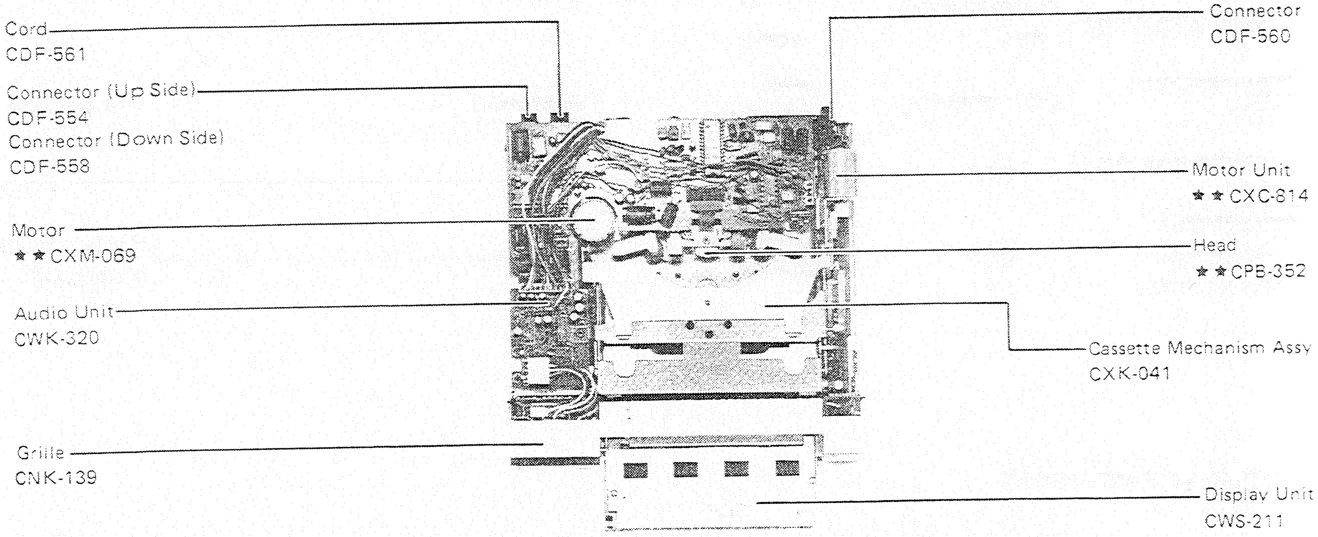

Cord
CDF-561
Connector (Up Side)
CDF-554
Connector (Down Side)
CDF-558
Motor
★★CXM-069
Audio Unit
CWK-320
Grille
CNK-139
Connector
CDF-560
Motor Unit
★★CXC-814
Head
★★CPB-352
Cassette Mechanism Assy
CXK-041
Display Unit
CWS-211

Fig. 1

● Tuner Section

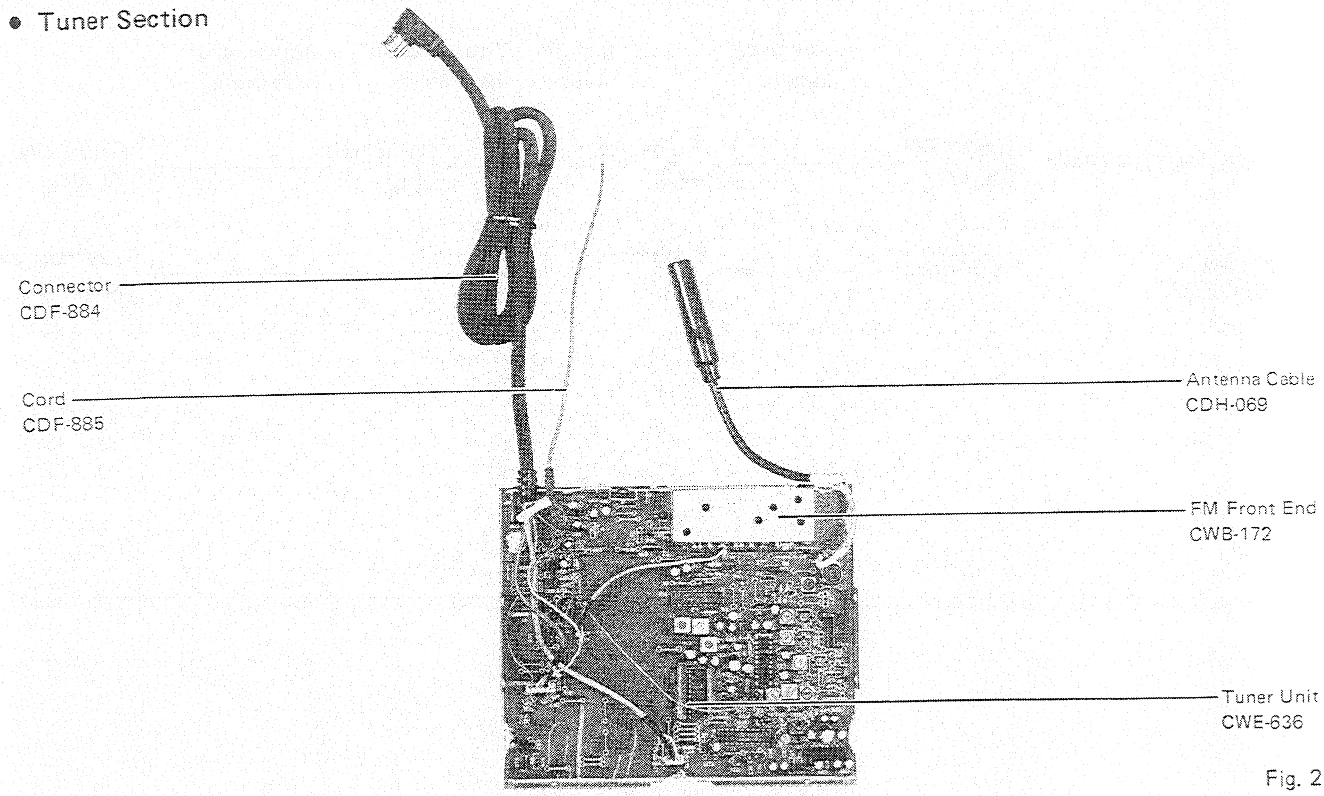
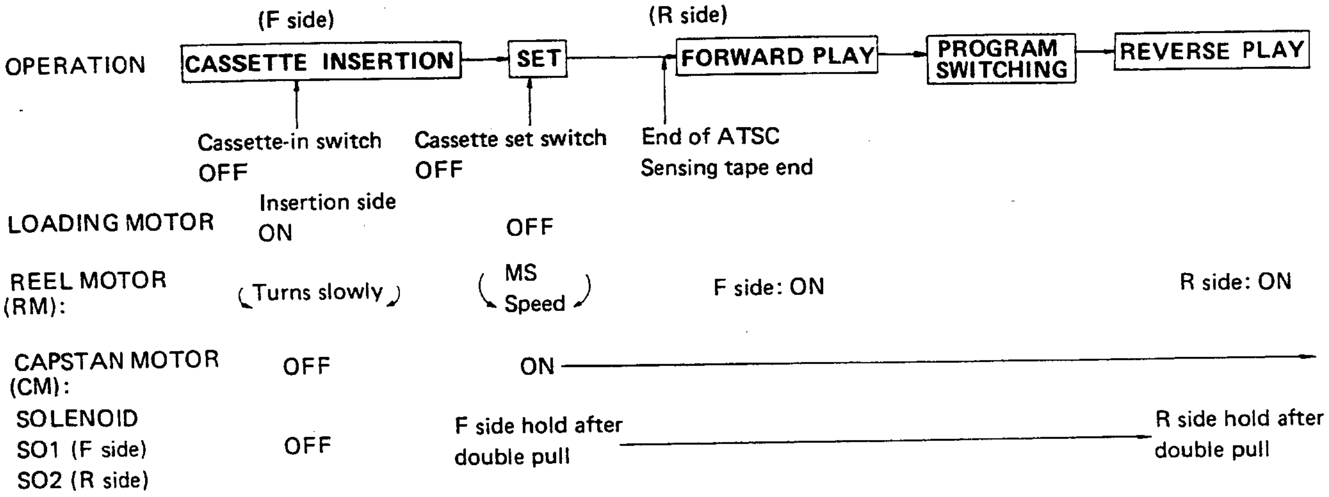

Connector
CDF-884
Cord
CDF-885
Antenna Cable
CDH-069
FM Front End
CWB-172
Tuner Unit
CWE-636

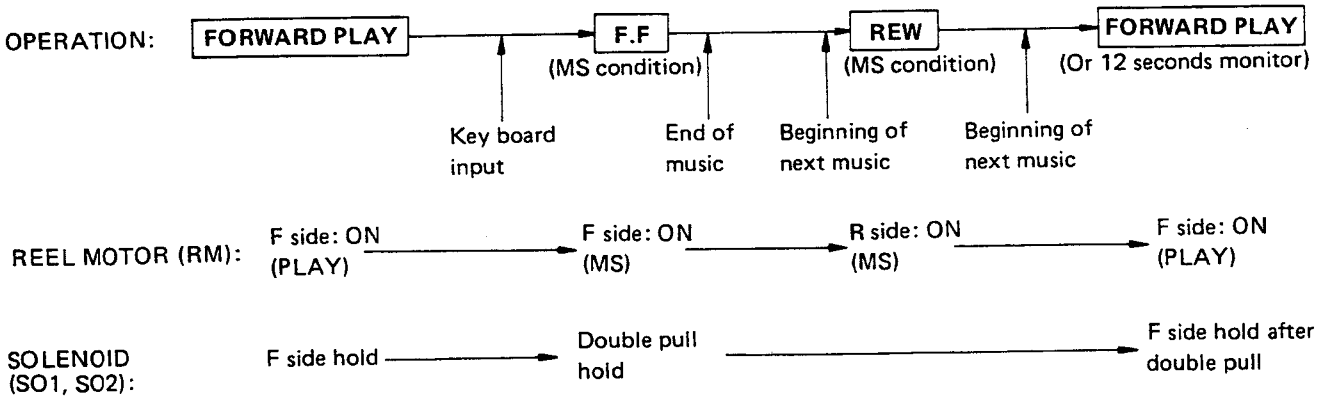
Fig. 2

5. OPERATION EXPLANATION

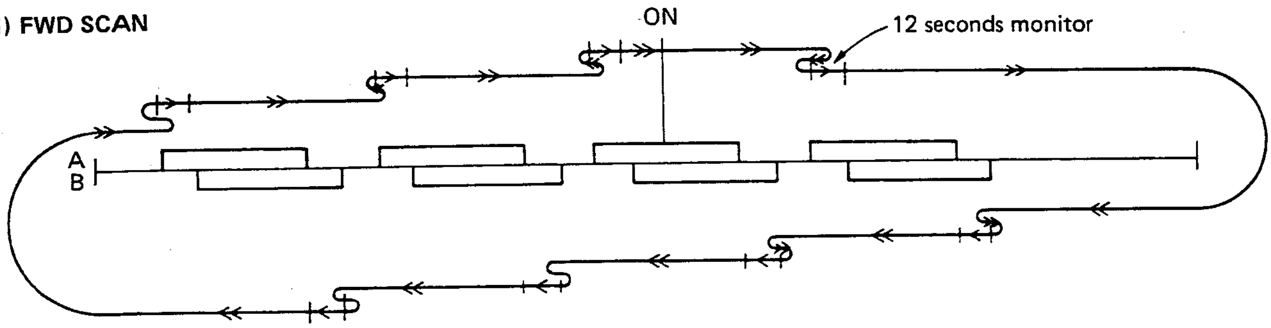
① OPERATION: INSERT CASSETTE→SET FORWARD PLAY→PROGRAM SWITCH→REVERSE PLAY


(F side)
(R side)
OPERATION
CASSETTE INSERTION
SET
FORWARD PLAY
PROGRAM SWITCHING
REVERSE PLAY
Cassette-in switch OFF
Cassette set switch OFF
End of ATSC
Sensing tape end
LOADING MOTOR
Insertion side ON
OFF
REEL MOTOR (RM):
(Turns slowly)
(MS Speed)
F side: ON
R side: ON
CAPSTAN MOTOR (CM):
OFF
ON
SOLENOID
SO1 (F side)
SO2 (R side)
OFF
F side hold after double pull
R side hold after double pull

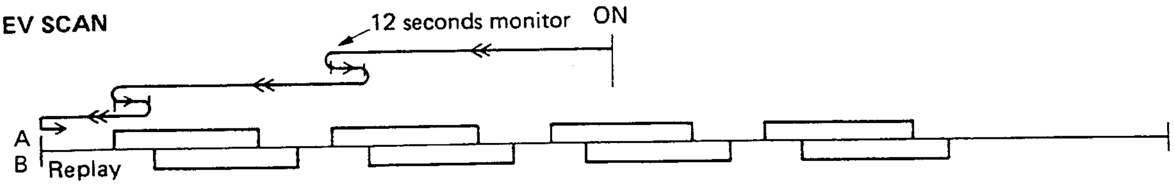
② During F.F MS or SCAN


OPERATION:
FORWARD PLAY
F.F
(MS condition)
REW
(MS condition)
FORWARD PLAY
(Or 12 seconds monitor)
Key board input
End of music
Beginning of next music
Beginning of next music
REEL MOTOR (RM):
F side: ON (PLAY)
F side: ON (MS)
R side: ON (MS)
F side: ON (PLAY)
SOLENOID (SO1, SO2):
F side hold
Double pull hold
F side hold after double pull

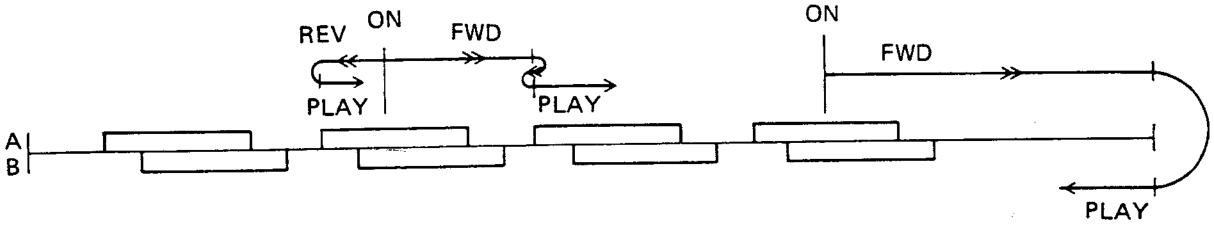
(1) FWD SCAN


ON
12 seconds monitor
A
B

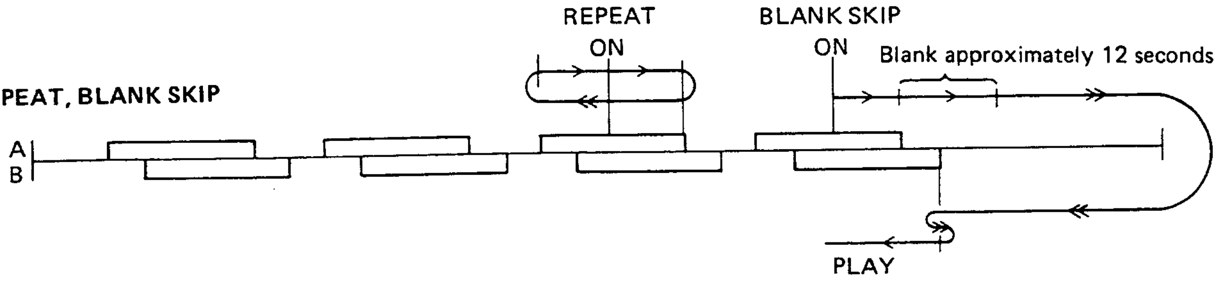
(2) REV SCAN


12 seconds monitor
ON
A
B
Replay

(3) MS


REV
ON
FWD
PLAY
PLAY
ON
FWD
A
B
PLAY

(4) REPEAT, BLANK SKIP


REPEAT
ON
BLANK SKIP
ON
Blank approximately 12 seconds
A
B
PLAY

A and B represent the A and B sides of the cassette.

A side moves in the direction of ⟶

→ or ← indicates PLAY condition.

↠ or ↞ indicates F.F or REW (for MS condition).

▭ indicates music portion

6. DISASSEMBLY

• Removing the Case

1. Undo 7 screws to remove the case unit.

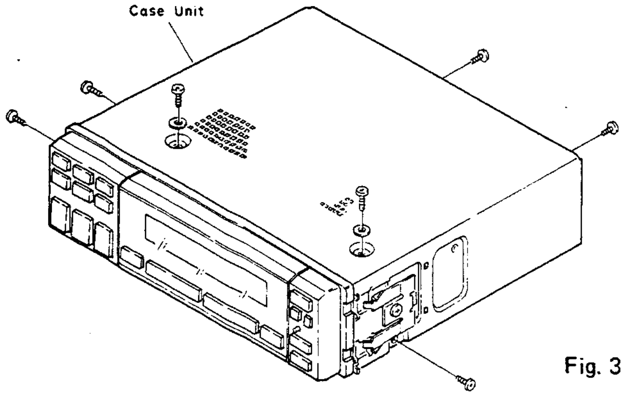


Fig. 3

• Removing the Cassette Mechanism Assy and Audio Unit

1. Undo the 5 screws indicated in the diagram.
2. Disconnect the 5P connector.
3. Remove the cassette mechanism assy and audio unit together towards the rear.

Note: When remounting the cassette mechanism assy check that none of the IC pins (of PD4022B and PD4050B) is damaged by the studs (see Fig. 5).

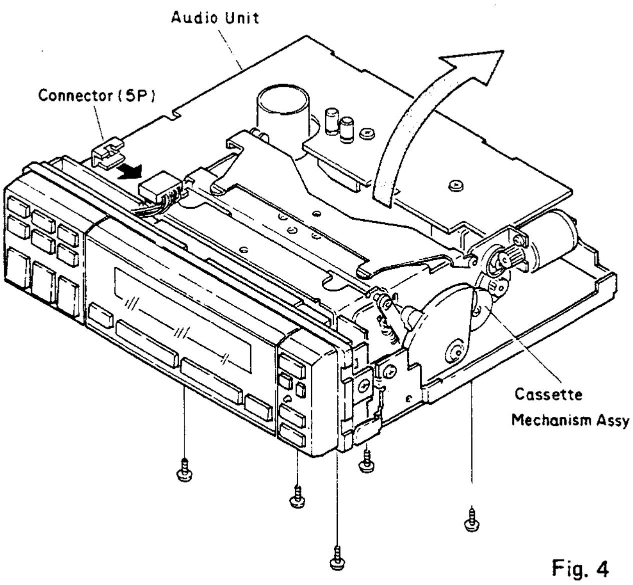

Audio Unit
Connector (5P)
Cassette Mechanism Assy

Fig. 4

• Removing the Power Unit

1. Undo 2 screws to remove the power unit in the direction indicated by the arrows.

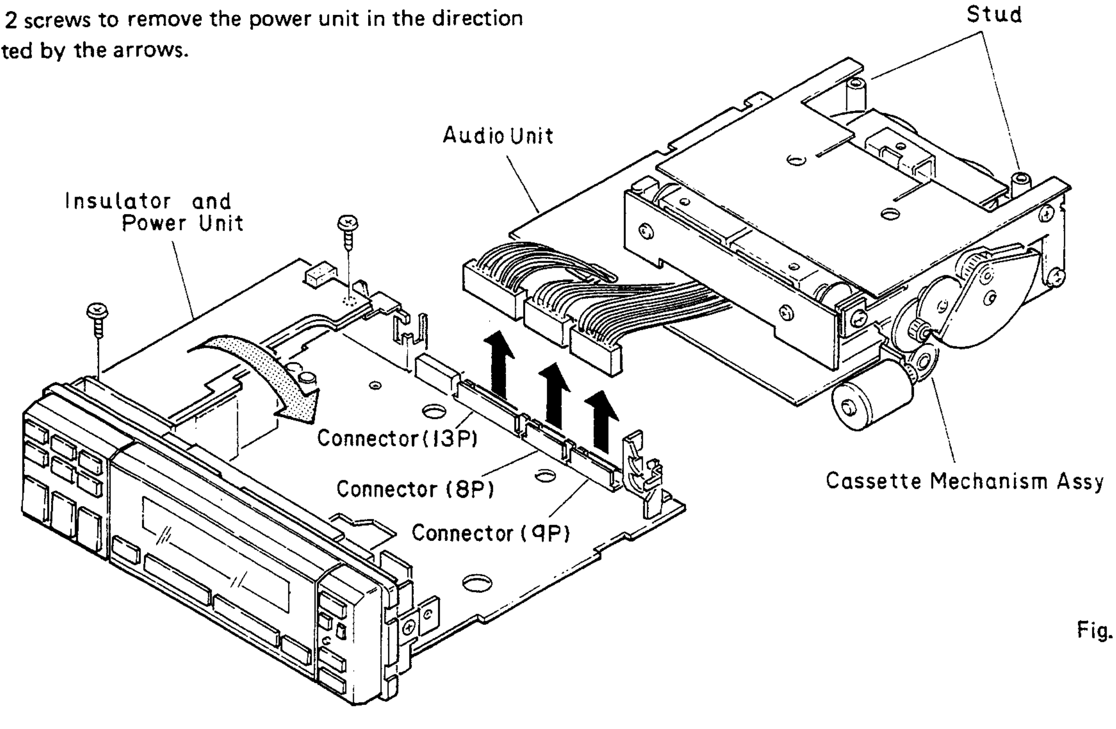

Stud
Audio Unit
Insulator and Power Unit
Connector (13P)
Connector (8P)
Connector (9P)
Cassette Mechanism Assy

Fig. 5

Removing the Chassis

1. Turn the set over, and undo 4 screws to release the chassis.

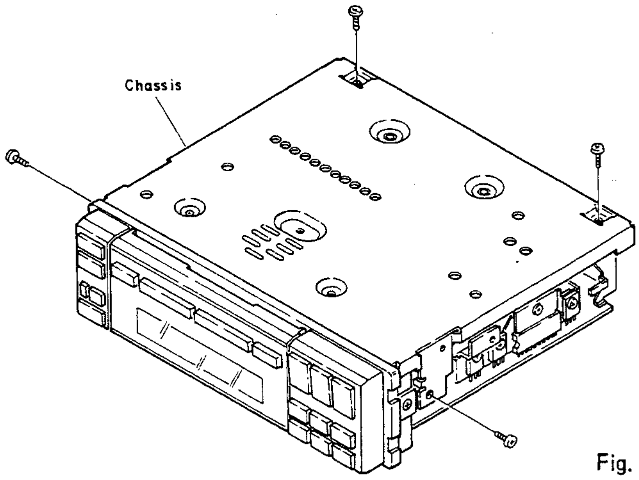


Fig. 6

Removing the Grille Unit

1. Undo 2 screws and remove the flexible board solder at A, B, and C to remove the grille unit.

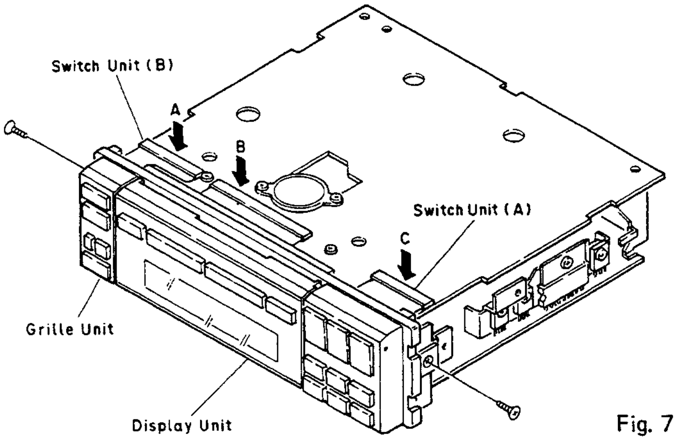

Switch Unit (B)
A
B
Switch Unit (A)
C
Grille Unit
Display Unit

Fig. 7

Removing Switch Unit (B)

1. Undo screw D to remove switch unit (B) together with the bracket.

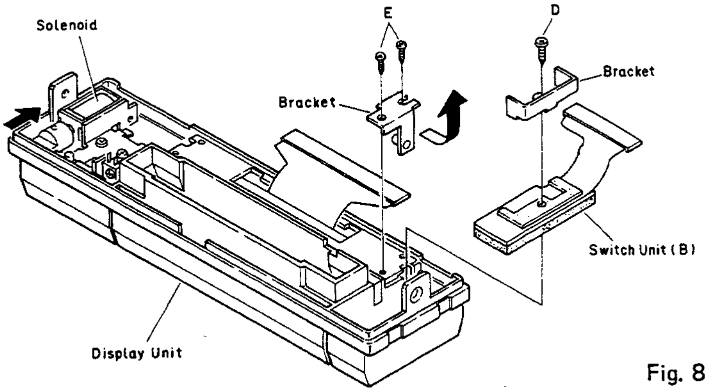

Solenoid
E
D
Bracket
Bracket
Switch Unit (B)
Display Unit

Fig. 8

Removing the Display Unit

1. Undo screws E to remove the bracket. Since the bracket serves as a fulcrum about which the display unit can turn, displace the unit sideways as indicated by the arrow to release the unit. (Fig. 8)
2. Depress the solenoid lever in the direction of the arrow to open the display unit. (Fig. 8)
3. The display can then be removed as indicated in Fig. 9.
4. The circuit board inside the display unit can be removed by undoing screws F.

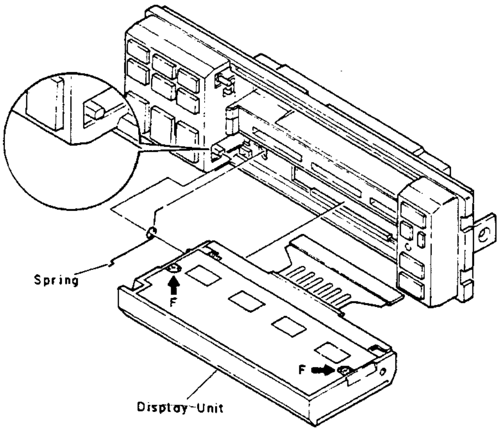

Spring
F
F
Display-Unit

Fig. 9

Removing Switch Unit (A)

1. Undo 2 screws to remove the solenoid unit (Fig. 10).
2. Undo 2 screws to remove the gear unit (Fig. 10).
3. Undo 2 screws to remove switch unit (A) (Fig. 11).

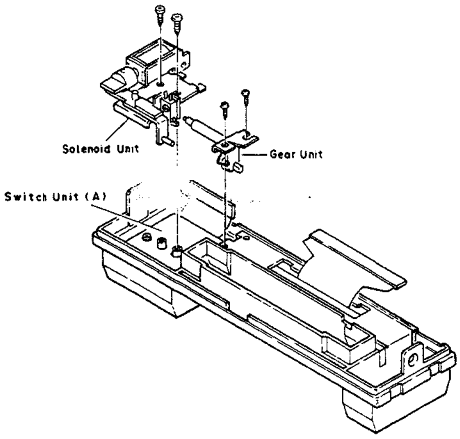

Solenoid Unit
Gear Unit
Switch Unit (A)

Fig. 10

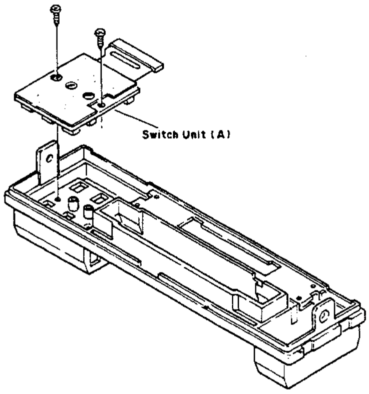

Switch Unit (A)

Fig. 11

7. CIRCUIT DESCRIPTION

7.1 CONTROL SECTION

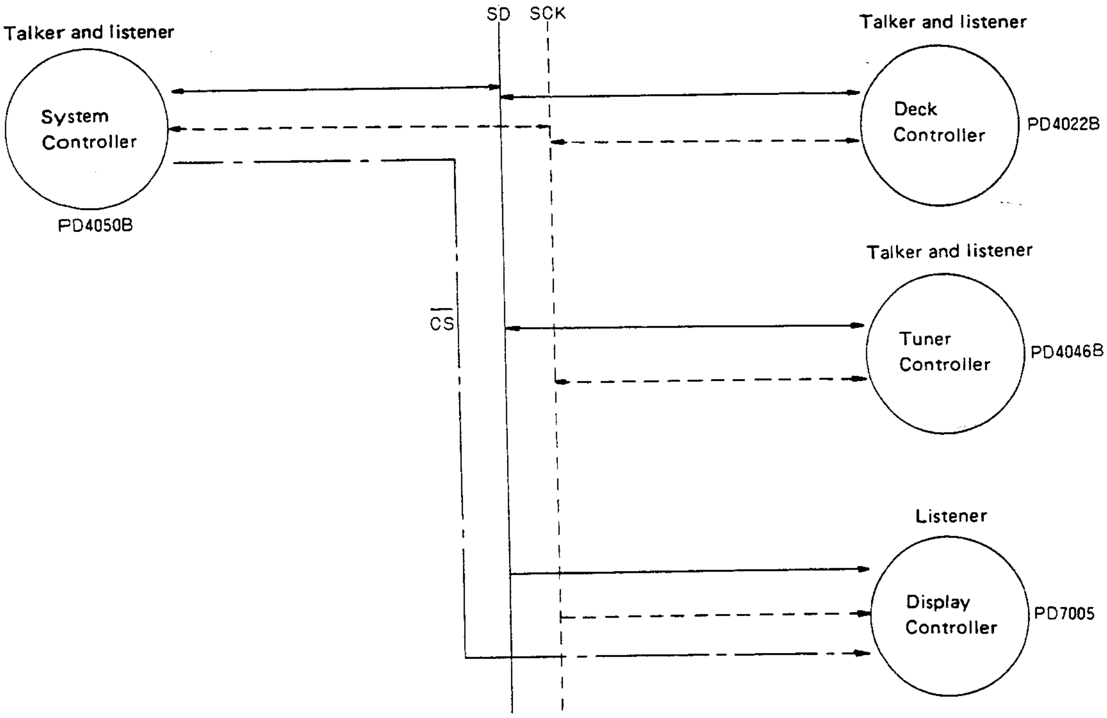

SD
SCK
Talker and listener
System Controller
PD4050B
Talker and listener
Deck Controller
PD4022B
Talker and listener
Tuner Controller
PD4046B
Listener
Display Controller
PD7005
$\overline{CS}$

Fig. 12 System diagram

• System Outline

The system controller(PD4050B)deck controller (PD4022B), and tuner controller(PD4046B) are inter-connected by 8-bit serial data transfer. The three signal lines are the data line (SD), serial clock line ($\overline{SCK}$), and the $\overline{CS}$ line between the system controller and display controller. The system, deck, and tuner controllers are switched automatically to talker and listener according to the timing indicated in Fig.13. The display controller is a listener only which receives 80-bit serial data inputs from the system controller via the $\overline{CS}$ signal line. Data transfer between controllers is executed by switching the system, deck, and tuner controllers to talker and listener on a cyclic basis (as indicated in Fig. 13). If no command output is received from the deck and tuner controller within two seconds after output of a command from the system controller, a reset output command is subsequently generated by the system controller. This is then followed by output of a standby command, resulting in both the tuner and deck being switched off. The deck and tuner controllers which have received the reset command from the system controller have been set to become listeners at any time. The standby command from the system controller is thus received under these conditions.

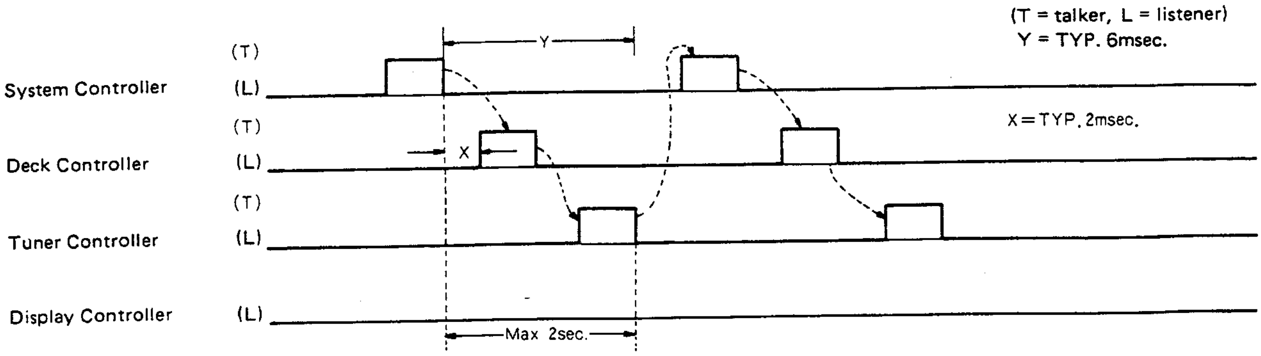
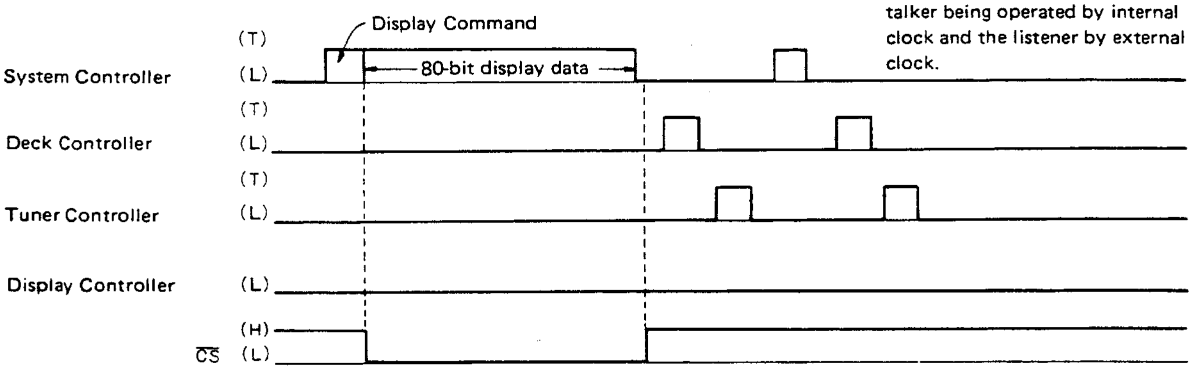

(T = talker, L = listener)
Y = TYP. 6msec.
X=TYP. 2msec.
Y
X
System Controller
(T)
(L)
Deck Controller
(T)
(L)
Tuner Controller
(T)
(L)
Display Controller
(L)
Max 2sec.

Fig. 13 Talker/listener switching timing

When the tuner is not connected to the system, the system controller is switched to talker after data is received from the deck controller.

When the system controller passes display data independently to the display controller, output of a display command when the system controller is a talker is followed by output of the $\overline{CS}$ signal and 80-bit display data to the display controller. After the display command is received the deck controller waits until transmission of the 80-bit display data has been completed before switching to talker status.

The tuner controller also waits for transmission of the 80-bit display data to be completed before switching to deck controller command reception mode. For the deck and tuner controllers to change the display contents in the display unit, each controller generates 80 bits of display data following output of the relevant command during talker status. Listener deck or tuner controller skips reading the 80 bits of data. Following input of the 80 bits of data, the system controller adds the necessary volume data etc, and switches temporarily to talker status for output of 80 bits of display data to the display controller.



* Serial clock is 100kHz, the talker being operated by internal clock and the listener by external clock.

Fig. 14 System controller display data transmission timing

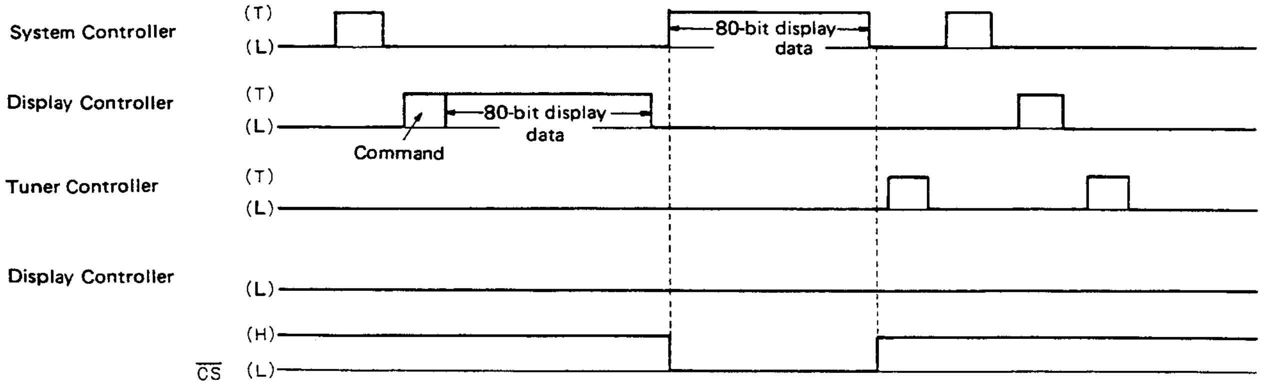


Fig. 15 Timing for display data output from deck controller

• Standby Function

The system controller checks whether the car's Acc key is ON or OFF at least once every 6msec. (pin 50). If the key has been switched OFF and the system controller is switched to talker status, a display command is generated and 80 bits of "all 0" data is passed to the display controller, resulting in the display being cleared. When the system controller is next switched to talker status, the standby command is passed to the deck and tuner controllers, resulting in the deck and tuner being switched off.

During standby mode (Acc OFF), the deck and tuner controllers back up only the RAM data, the CPU functions being halted. If the system controller check finds that Acc is ON, the clock counter functions are continued. If the Acc ON condition is detected for two seconds, the system controller transmits a display command to the serial interface together with the display data preceding the change to Acc OFF condition, resulting in the deck and tuner controller standby mode being cancelled by that data. If the mode when Acc is switched OFF is deck or tuner mode, a tape or tuner command is generated and the mode is reverted to the mode when Acc was OFF.

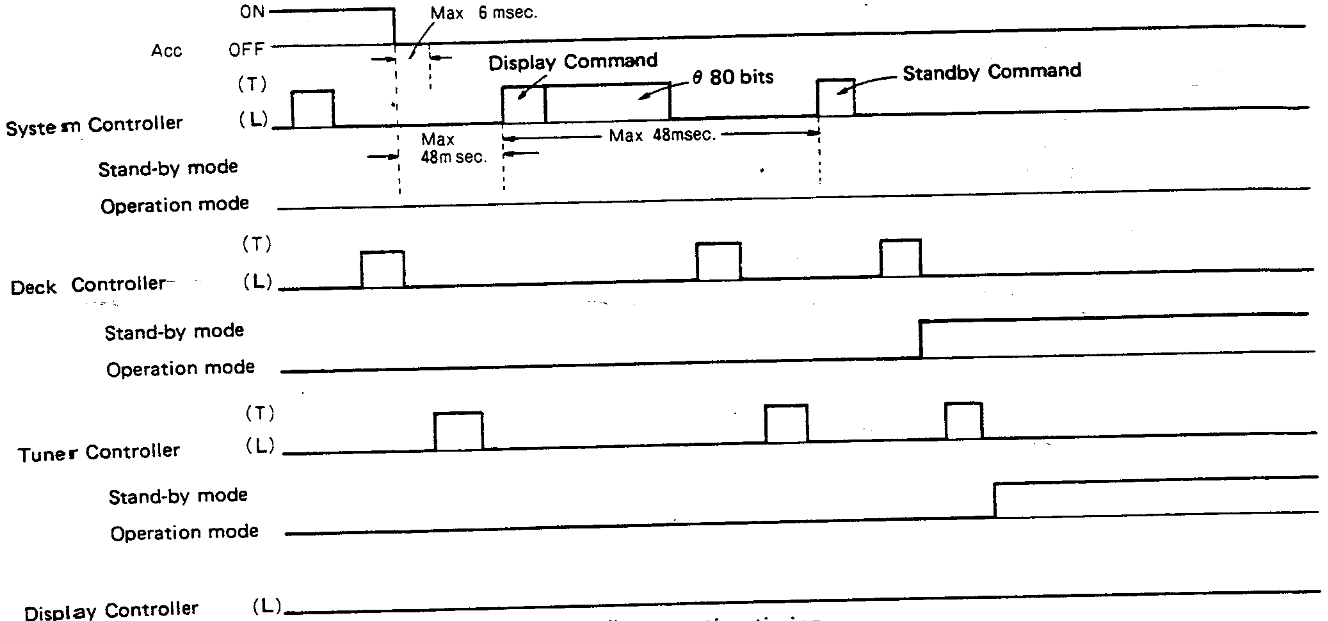

Acc
ON
OFF
Max 6 msec.
Display Command
θ 80 bits
Standby Command
System Controller
(T)
(L)
Max 48m sec.
Max 48msec.
Stand-by mode
Operation mode
Deck Controller
(T)
(L)
Stand-by mode
Operation mode
Tuner Controller
(T)
(L)
Stand-by mode
Operation mode
Display Controller
(L)

Fig. 16 Standby operation timing

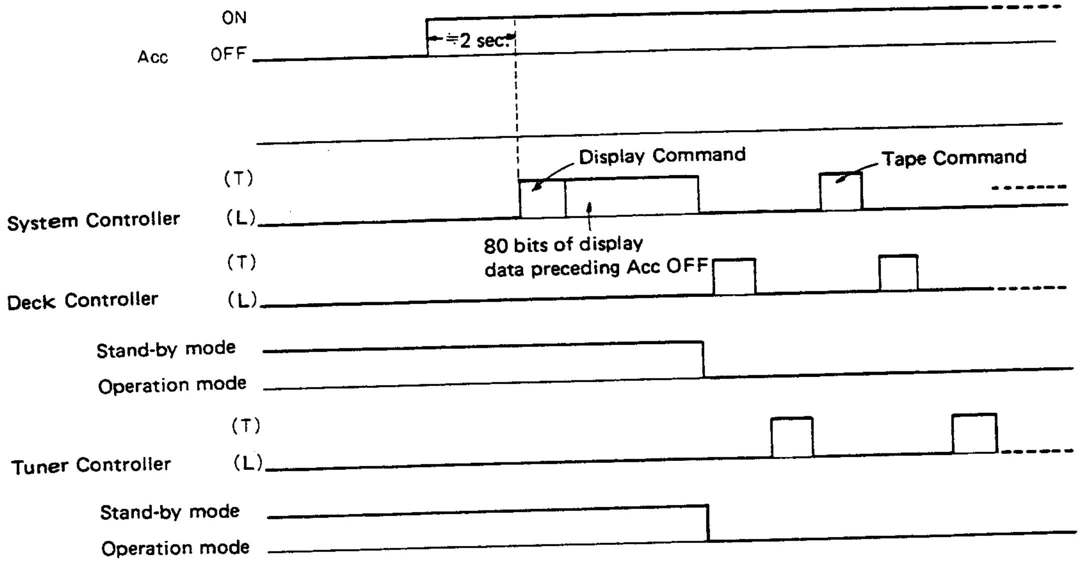

Acc
ON
OFF
≒2 sec
Display Command
Tape Command
System Controller
(T)
(L)
80 bits of display data preceding Acc OFF
Deck Controller
(T)
(L)
Stand-by mode
Operation mode
Tuner Controller
(T)
(L)
Stand-by mode
Operation mode

Fig. 17 Standby cancellation timing (when in deck mode before Acc is switched OFF).

- Tape Tuner Switching

1. Switching from tape to tuner.

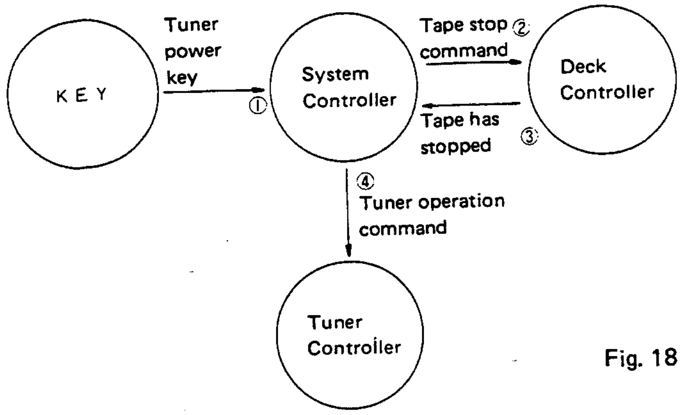

KEY
Tuner power key
①
System Controller
Tape stop command ②
Deck Controller
Tape has stopped ③
④ Tuner operation command
Tuner Controller

Fig. 18

If the tuner power switch is pressed during tape operation, a "tape stop command" from the system controller is passed to the deck controller. When the system controller then receives data indicating that the "tape has stopped" in response from the deck controller, a "tuner operation" command is passed to the tuner controller, thereby switching from tape to tuner operation.

2. Switching from tuner to tape

a. When the tape power switch is pressed (Fig. 19)

Then the tape power switch is pressed during tuner mode operation, a "tuner stop" command is passed from the system controller to the tuner controller. When the system controller then receives data indicating that the "tuner has stopped" in response from the tuner controller, a "tape operation" command is passed to the deck, thereby switching the set from tuner to tape operation.

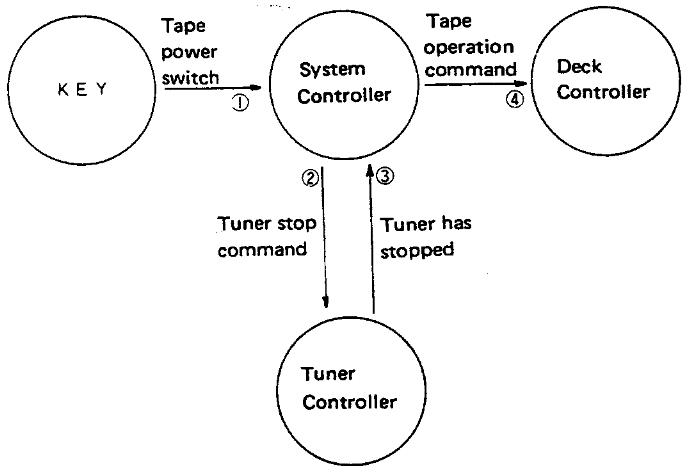

KEY
Tape power switch
①
System Controller
Tape operation command
④
Deck Controller
②
③
Tuner stop command
Tuner has stopped
Tuner Controller

Fig. 19

b. When a cassette tape is loaded (Fig. 20)

When a cassette tape is loaded during tuner operation, "tape operation request" data is passed from the deck controller to the system controller. When the system controller receives this data, a "tuner stop" command is passed to the tuner controller, and after data indicating that the "tuner has stopped" is received from the tuner controller, a "tape operation" command is passed to the deck controller. Hence, the set is switched automatically from tuner to tape when a cassette tape is loaded.

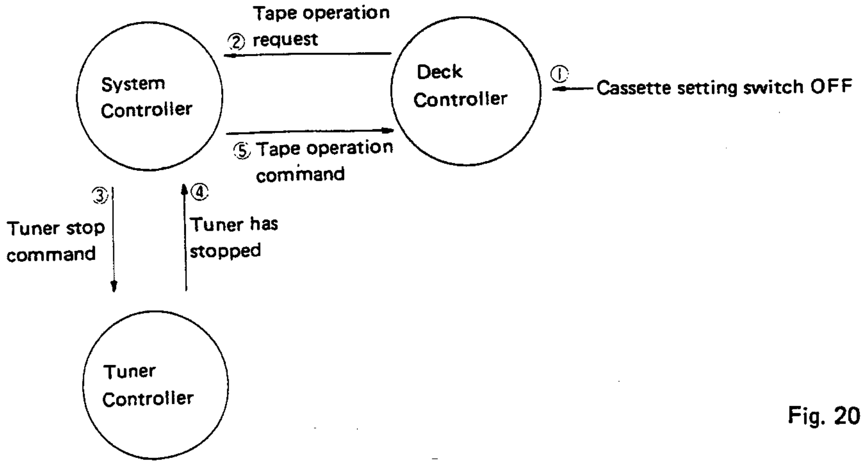

Tape operation
② request
System Controller
Deck Controller
①
Cassette setting switch OFF
⑤ Tape operation command
③
④
Tuner stop command
Tuner has stopped
Tuner Controller

Fig. 20

7.2 POWER SUPPLY CIRCUIT

a. Backup +B

To keep memories, backup +B is supplied to PD4050B and PD4022B even when the ignition switch is off. The +B (14.4V) battery source directly flows through D8 in the Power Unit and is reduced to 5.3V for V_{DD} +B by the voltage regulator composed of Q4, D5, D6, etc. This V_{DD} +B (5V) is applied to pins #7 and #33 (V_{DD}) of PD4050B and PD4022B and to pin #5 (V_{DD}) of PD7005. The 14.4V backup +B is applied to the Tuner Section and passes D22, is reduced to V_{DD} +B by a zener diode D21 (VZ: 5.1V) and is applied to pins #7 and #33 (V_{DD}) of PD4046B. If the lines open, all memories will be lost. Refer to Fig. 22.

b. Acc +B

When the ignition switch is turned on, Acc +B (14.4V) is applied to pins #7 (V_{CC1}) and #8 (V_{CC2}) of BA6209 and #5 of PA3009.

c. +B supply for TAPE

When the TAPE is loaded, the deck controller PD4022B puts TAPE ON signal (H: 5V) out of #23. This signal turns Q23 and Q6 in Control Unit on.(*1) When Q6 turns on, Acc +B flows through D24-1, R164 and D26 (zener diode Vz: 6.2V) and turns Q40 and Q7 on.(*2) When Q7 turns on, Acc +B becomes BT +B and is applied to DC-DC converter L1 #4 for displaying.
This BT +B (14.2V) is reduced to 10V by the voltage regulator composed of Q6, D9, etc. in Power Unit and is applied to each of the PA0005A #16, HA17358 #8 and PA2014 #1 Vcc terminals. And the BT +B (10V) flows in D2 and is made 8.9V by D2's forward voltage drop (V_F) and is applied to TA75558P #8 (Vcc). After passing Q6, Control Unit, the Acc +B is reduced to TAPE +B1 (10V) by the regulator composed of Q1, Q2, Q3, D3, etc. in the Power Unit and is fed to PA0008 #10 (Vcc). This regulator employs a differential amplifier as a voltage sensor to stabilize output voltage and to minimize wow and flutter. If the reference voltage for the circuits which control the Reel Motor and Capstan Motor fluctuates, the servo circuits will not work properly and will increase wow and flutter. The TAPE +B1 (9.7V) is further reduced to 5V by the regulator composed of Q5, D4, D5, etc. in the Power Unit and is fed to PA0002A #4 (Vcc). The TAPE +B1 (9.7V) goes through R67 and turns Q2 and Q1 on. Then TAPE +B2 is fed to PA3017 #1 (Vcc). TAPE +B2 is also fed to TA7705P #1 (Vcc) via D1.

d. +B Supply for TUNER

When TUNER is turned on PD4050B #19 puts out TUNER ON signal (H:5V). This signal turns Q25 and Q24 on. When Q24 turns on, Acc +B flows through D24-2, R164 and D26 and turns Q40 and Q7 on. The BT +B is applied to each AF IC in the same way as in the mode of TAPE ON. But, TAPE +B2 to the Vcc of TA7705P and PA3017, which have no relation to the Tuner, is blocked by inactive Q1.
Next, we will discuss +B supply circuit of the tuner circuit. When the tuner is turned on, TUNER ON signal (H: 5V) appears at pin #2 of tuner controlling micro-computer PD4046B. The signal goes through R94 to turn on Q24 and Q23, supplying Backup +B (14.4V) to the regulator IC AN6540 and the Loop Filter. The Backup +B (14.4V) is reduced to 4.8V by the regulator circuit consisting of Q22, D20 and C81 before supplied to pin #7 of MN6147. The Backup +B supplied to the regulator IC AN6540 is decreased to 8.5V which appears at pin #4 and is supplied to pin #1 of PA2014, Q13 and Q14.
In FM reception, PD4046B provides FM ON signal at pin #51, turning on Q16 and Q14 through R71. When Q14 turns on, FM +B is supplied to FM frontend, pin #15 (Vcc) of PA0013, pin #11 (Vcc) of PA0014 and pin #13 (Vcc) of PA0015.
In AM reception, PD4046B provides AM ON signal at pin #50, turning on Q15 and Q13 through R70. When Q13 turns on, AM +B is supplied to pin #4 (Vcc) of HA12434.

**1 The reason for connecting resistors in parallel:*
Some circuits require a large current. This connection allows a large current to go through resistors of small power capacity. The power capacity of each chip-resistor is only 1/8W at present and is insufficient to allow a large current. But by connecting two resistors in parallel the total current can be doubled. Many resistors in other models and equipment have been connected in parallel for this reason.

**2 The role of zener diode D26*
The BT +B is used for the SWD (switched) +B of power amplifier (for example, GM-A120). So, the power amplifier is turned on and off by BT +B. This SWD +B is used also to mute the audio signal. So, if the falling time of BT +B is long, it takes a long time to activate muting and allows a popping noise when the TUNER or TAPE is turned off. To prevent this, zener diode D26 makes Q40 turn off and block the BT +B quickly after the TUNER or TAPE is turned off.

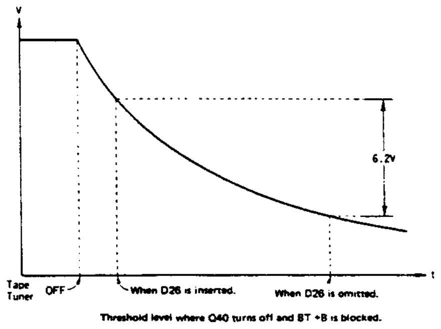


Fig. 21

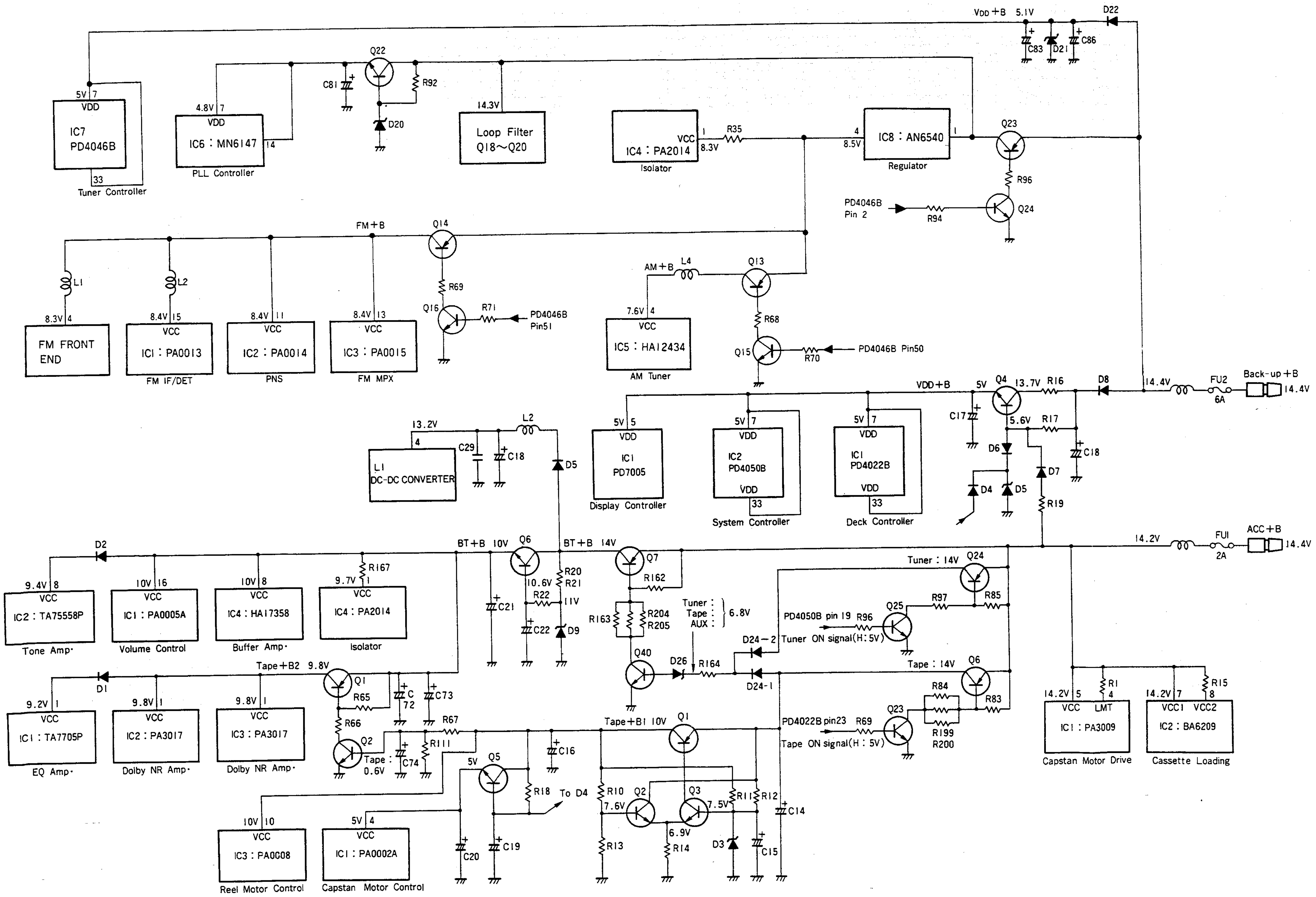

VDD +B 5.1V
D22
C83
D21
C86
5V 7
VDD
IC7
PD4046B
33
Tuner Controller
4.8V 7
VDD
IC6 : MN6147
14
PLL Controller
Q22
C81
R92
D20
14.3V
Loop Filter
Q18～Q20
VCC 1
IC4 : PA2014
8.3V
Isolator
R35
4
8.5V
IC8 : AN6540
1
Regulator
Q23
R96
PD4046B
Pin 2
R94
Q24
FM+B
Q14
R69
Q16
R71
PD4046B
Pin51
L1
L2
8.3V 4
FM FRONT
END
8.4V 15
VCC
IC1 : PA0013
FM IF/DET
8.4V 11
VCC
IC2 : PA0014
PNS
8.4V 13
VCC
IC3 : PA0015
FM MPX
AM+B
L4
Q13
R68
7.6V 4
VCC
IC5 : HA12434
AM Tuner
Q15
R70
PD4046B Pin50
VDD+B
5V
Q4
13.7V
R16
D8
14.4V
FU2
6A
Back-up +B
14.4V
C17
5.6V
R17
C18
D6
D7
D4
D5
R19
5V 5
VDD
IC1
PD7005
Display Controller
5V 7
VDD
IC2
PD4050B
VDD
33
System Controller
5V 7
VDD
IC1
PD4022B
VDD
33
Deck Controller
13.2V
L2
4
L1
DC-DC CONVERTER
C29
C18
D5
BT+B 10V
Q6
BT+B 14V
Q7
14.2V
FU1
2A
ACC+B
14.4V
D2
9.4V 8
VCC
IC2 : TA75558P
Tone Amp·
10V 16
VCC
IC1 : PA0005A
Volume Control
10V 8
VCC
IC4 : HA17358
Buffer Amp·
R167
9.7V 1
VCC
IC4 : PA2014
Isolator
C21
R20
R21
10.6V
R22
11V
C22
D9
R162
R163
R204
R205
Tuner :
Tape :
AUX :
6.8V
Q40
D26
R164
D24-2
D24-1
Tuner : 14V
Q24
R97
R85
Q25
PD4050B pin 19
R96
Tuner ON signal(H : 5V)
Tape : 14V
Q6
R84
R83
Q23
PD4022B pin23
R69
Tape ON signal(H : 5V)
R199
R200
Tape+B2 9.8V
Q1
D1
R65
C
72
C73
9.2V 1
VCC
IC1 : TA7705P
EQ Amp·
9.8V 1
VCC
IC2 : PA3017
Dolby NR Amp·
9.8V 1
VCC
IC3 : PA3017
Dolby NR Amp·
R66
Q2
Tape :
0.6V
C74
R67
R111
5V
Q5
R18
To D4
C16
Tape+B1 10V
Q1
R10
Q2
7.6V
Q3
7.5V
R11
R12
C14
6.9V
R13
R14
D3
C15
10V 10
VCC
IC3 : PA0008
Reel Motor Control
5V 4
VCC
IC1 : PA0002A
Capstan Motor Control
C20
C19
R1
14.2V 5
4
VCC
LMT
IC1 : PA3009
Capstan Motor Drive
R15
14.2V 7
8
VCC1
VCC2
IC2 : BA6209
Cassette Loading

Fig. 22 Power Supply Circuit

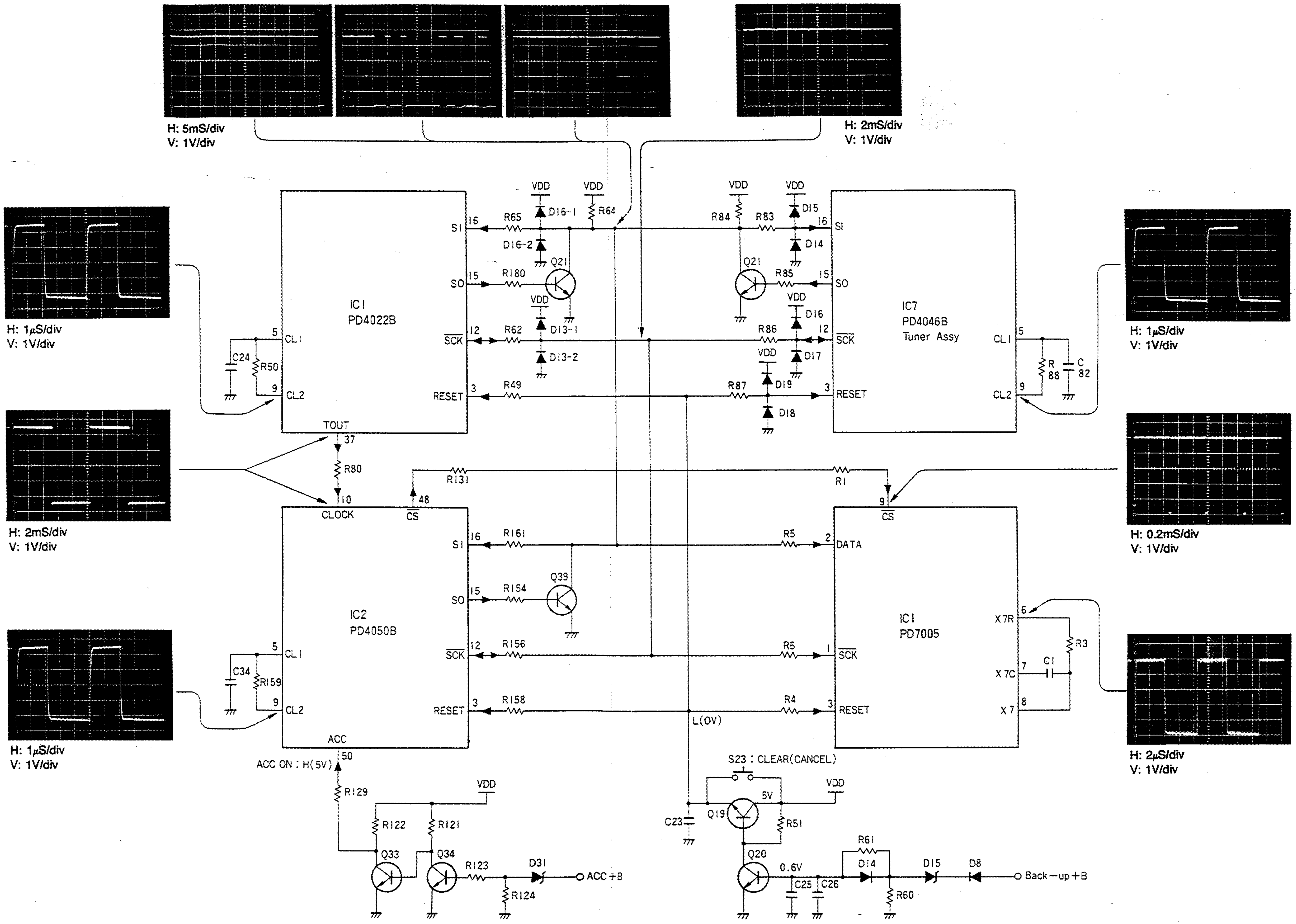

H: 5mS/div
V: 1V/div
H: 2mS/div
V: 1V/div
H: 1μS/div
V: 1V/div
H: 2mS/div
V: 1V/div
H: 1μS/div
V: 1V/div
H: 1μS/div
V: 1V/div
H: 0.2mS/div
V: 1V/div
H: 2μS/div
V: 1V/div
IC1
PD4022B
SI
SO
SCK
RESET
CL1
CL2
TOUT
C24
R50
VDD
R65
D16-1
D16-2
R64
R180
Q21
D13-1
D13-2
R62
R49
R80
IC7
PD4046B
Tuner Assy
R84
R83
D15
D14
R85
D16
R86
D17
D19
D18
R87
R88
C82
R131
R1
CLOCK
CS
IC2
PD4050B
ACC
C34
R159
R161
R154
Q39
R156
R158
IC1
PD7005
DATA
X7R
X7C
X7
R5
R6
R4
R3
C1
L(OV)
ACC ON : H(5V)
R129
R122
R121
Q33
Q34
R123
D31
R124
ACC+B
S23 : CLEAR(CANCEL)
5V
Q19
R51
C23
Q20
0.6V
C25
C26
R61
D14
D15
D8
R60
Back-up+B

Fig. 23 Basic Circuit for Operating the System

7.3 BASIC CIRCUIT FOR OPERATING THE SYSTEM

Here we will discuss the basic circuit for operating microcomputers (PD4050B, PD4022B and PD4046B), which are the cores of the system, and Display Control PD7005. Refer to Fig. 23.

a. System Clock (CL1 & CL2)

The clock generator gives a reference timing to each computer. The resistor and capacitor connected to CL1 and CL2 determine oscillation frequency. The pins # 7 (X7C), #6 (X7R) and # 8 (X7) of PD7005 work in the same way as above. The oscillation frequency of all generators is 200kHz. Refer to the circuit diagram for the waveforms at each terminal.

b. Timing Clock (T OUT)

This circuit generates squarewave synchronizing clock signal of 100Hz (50% duty factor for operating PD4050B). PD4022B # 37 (T OUT) feeds PD4050B # 10 (CLK) with this CLK signal because PD4050B has no timing clock generator inside.

c. RESET

This circuit resets the initial state of the computer programs and their Display Controller PD7005. When the backup +B is connected, this resets the computers and PD7005 by feeding the RESET terminal (# 3) with an H pulse of about 25ms. Without resetting, the computers will work randomly and become uncontrollable.

When the Backup +B is connected, V_{DD} is fed to the computers and PD7005. At this time, Q20 in the Control Unit is off, Q19 is biased by R51 and is turned on. V_{DD} is fed to PD4050B # 3 via R158, to PD4022B # 3 via R49, to PD4046A # 3 via R131 and to PD7005 # 3 via R4 and shifts the level of the terminals to H (5V). The +B charges C25 and C26 via D8, D15 and R61. Q20's V_B rises as the charge in C25 and C26 increases. Q20 turns on when its V_B becomes 0.7V. Q19 turns off. Then the potential at all RESET terminals is shifted from H (5V) to L (0V) and resetting is completed. When the CLEAR (CANCEL) button (S23) is depressed, all of their P3 terminals are shifted to H in the same way as when the power is turned on. When the button is released the level falls to L (0V) and at the falling edge resetting is executed.

d. Acc

When PD4050B # 50 (Acc) is L (0V), PD4050B keeps memory, counts clock, senses low or high Acc input and TUNER connection, and stops all other functions. To operate the system the potential at PD4050B # 50 should be H (5V). When +B is fed from Acc (red line), a current is fed to Q34-B via D31 and R123. Q34 turns on. Then Q33 turns off. V_{DD} (5V) is fed to PD4050B # 50 via R122 and R129.

e. Serial Data Circuit (SO, SI and DATA)

Centering PD4050B, the three microcomputers communicate with each other using a data line or bus. PD4050B periodically gives PD4022B or PD4046B a command, and PD4022B or PD4046B responds it. The command and response are transmitted in the form of 8-bit serial data.

The data bus also allows the 80-bit serial display data to pass. The waveforms of the signals on the bus (or at the SI terminal of each computer) observed on an oscilloscope are shown in the circuit diagram. Still waveforms are unavailable because they always vary quickly. Three examples of the waveforms have been illustrated in the circuit diagram. The data communication among the computers can be deemed to be normal as long as a waveform similar to the example can be observed at SI and DATA terminals because the form on the oscilloscope screen flows and never stays still.

The transistors connected to each output terminal (SO) of the computers work as invertering buffers. There will be no problem with the input and output connected to the same line because a command has a code which fits a particular computer, and each computer accepts only the input signal which has a code fit to it.

f. SCK

This terminal puts in or out synchronizing clock signals for controlling serial data transmission. When talking, the computer is in the output mode and, when listening, in the input mode and it accepts SCK signal from the talking computer. At this time, talker's SCK data appear on the bus in series. The waveform of the signal on the SCK terminal observed on the oscilloscope is as shown in the circuit diagram. The still form of this wave is also unavailable with an ordinary oscilloscope.

g. CS

PD4050B does not put out a command with the code explained above for DISPLAY but puts out a CS signal (L pulse) from # 48 synchronizing with its 80-bit serial DISPLAY data. PD7005 accepts the DISPLAY data coming from PD4050B # 15 (SO) only when CS is L (0V), then decodes and displays them. It is also impossible to observe the still waveform of these data on the oscilloscope.

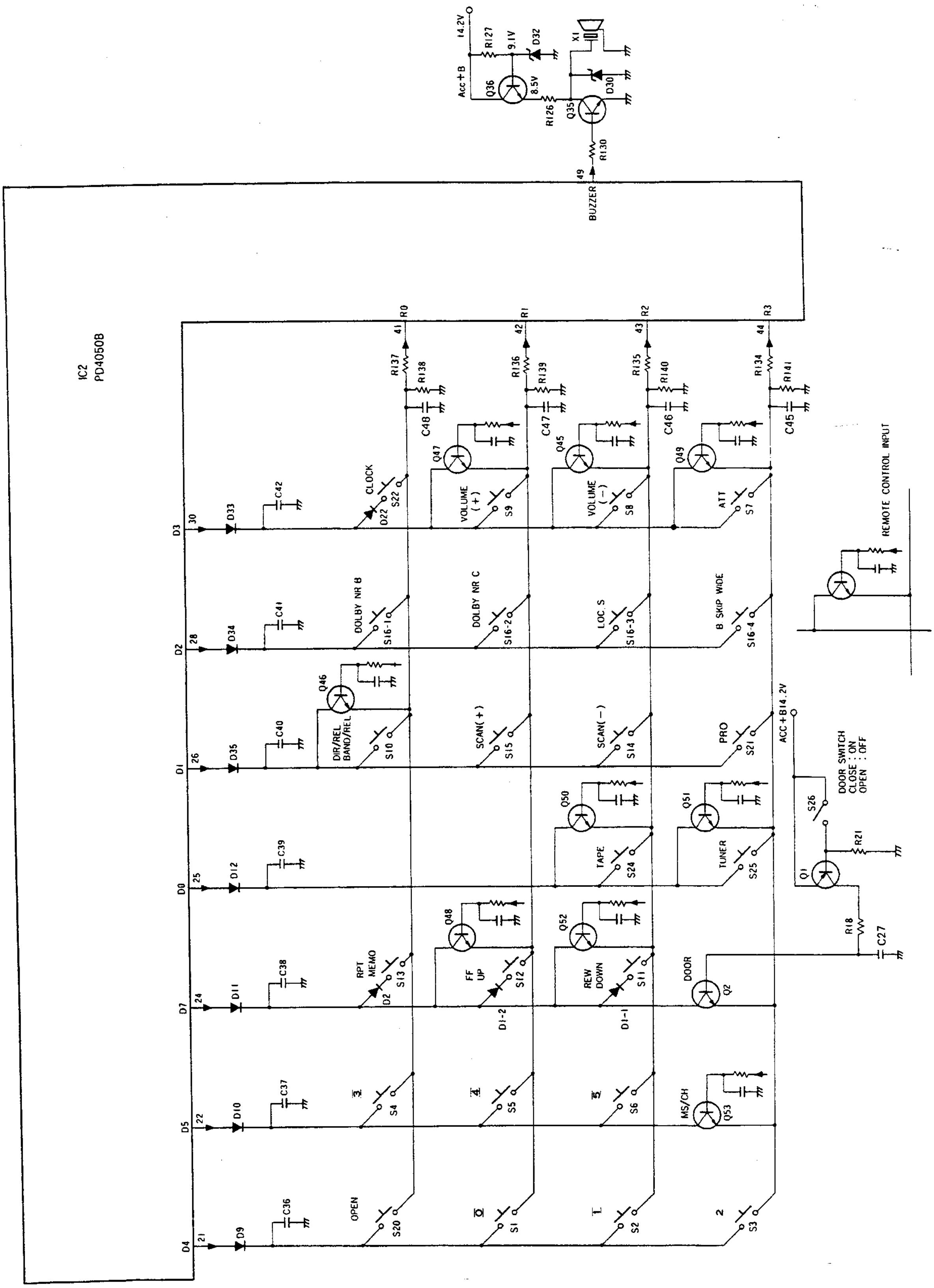

IC2
PD4050B
14.2V
R127
9.1V
D32
Acc+B
Q36
8.5V
R126
Q35
D30
X1
R130
49
BUZZER
41 R0
42 R1
43 R2
44 R3
R137
R138
R136
R139
R135
R140
R134
R141
C48
C47
C46
C45
Q47
Q45
Q49
CLOCK
S22
D22
VOLUME (+)
S9
VOLUME (−)
S8
ATT
S7
REMOTE CONTROL INPUT
D3 30 D33 C42
D2 28 D34 C41
D1 26 D35 C40
D0 25 D12 C39
D7 24 D11 C38
D5 22 D10 C37
D4 21 D9 C36
DOLBY NR B
S16-1
DOLBY NR C
S16-2
LOC. S
S16-3
B SKIP WIDE
S16-4
Q46
DIR/REL
BAND/REL
S10
SCAN(+)
S15
SCAN(−)
S14
PRO
S21
ACC+B14.2V
DOOR SWITCH
CLOSE : ON
OPEN : OFF
S26
R21
Q1
R18
C27
Q50
Q51
TAPE
S24
TUNER
S25
Q48
Q52
RPT
MEMO
S13
D2
FF
UP
S12
D1-2
REW
DOWN
S11
D1-1
DOOR
Q2
3
S4
4
S5
5
S6
MS/CH
Q53
OPEN
S20
0
S1
1
S2
2
S3

Fig. 24 System Control Input Circuit

7.4 SYSTEM CONTROL INPUT CIRCUIT

Here we will discuss the key input of the system control PD4050B. Refer to the Circuit Diagram, Fig. 24.

a. Key Input Circuit

The key input consists of 8 strobe outputs and 4 return inputs connected in matrix, however, it is actually 7 × 4 because the pin #23 (D6) is left unused. This strobe signal (D0-D7) is put out in the timing shown in Fig. 25. When the TUNER button is depressed, S25 turns on. The #25 (D0) output is fed to the pin #44 (R3) via D12, S25 and R134. Then, PD4050B sends a command to PD4046B in the tuner circuit and activates the tuner circuit. At this time, PD4050B puts out a 3.8kHz square wave signal from the pin #49 (BUZZER) for 30ms to inform that it has accepted the TUNER-ON key input.

As this signal is 5V and is not strong enough to drive piezo-electric buzzer (X1) directly, it goes to Q35 via R130, turns Q35 on and off for 30ms and is amplified to 8.5V and drives the buzzer. Then a "beep" sound is generated every time the key input is accepted. If there is trouble in the above circuit, no sound will be generated even though the key is depressed. Zener diode D30 (Vz: 20V) is to absorb the counter-electromotive force generated in the buzzer.

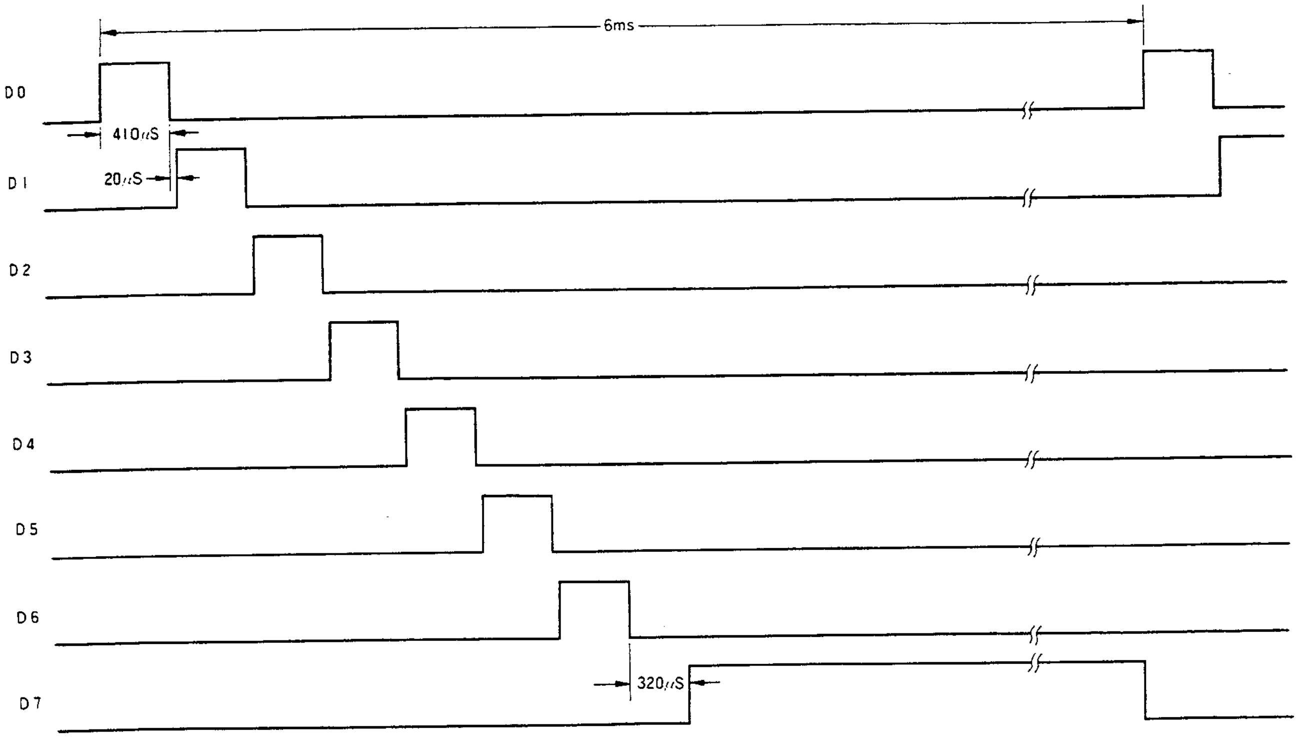


Fig. 25 Strobe Signal Timing

b. Door Sense Input (Q2)

PD4050B senses the state of the door with this circuit as this model has no exclusive EJECT key (button). A key is commonly used for opening and ejecting. So, PD4050B has to determine whether to open the door or eject the tape when OPEN (S20) is depressed. This circuit feeds PD4050B with a signal to open the door when it is close and to eject the tape when it is open.

When the door is closed, S26 is closed. Q1 and Q2 are off. Then, the signal from #24 (D7) to #44 (R3) is blocked. When the door is open, S26 opens, Q1 and Q2 turn on, and the signal is fed to #44 (R3).

c. Remote Control Input Circuit

A remote control signal selects a function by activating the transistor connected in parallel to the tact switch of a particular function in the Switch Unit. But the remote controller does not have the functions of command buttons (0) — (5). So PD4050B selects the mode (0) when Q53 (MS/CH) is turned on. When Q53 (MS/CH) turns on once, PD4050B recognizes the signal as (0). When it turns on twice successively, the IC recognizes it as (1), three times, as (2), and so on.

7.5 ILLUMINATION AND DISPLAY CIRCUIT

Here we will discuss the circuits of the TAPE/TUNER and other displays. Refer to Fig. 27 for the circuit diagram.

a. Illumination for Each Button

ILMI +B (14.2V) is fed from power amplifier (e.g. GM-A120) to this circuit. The +B goes to the LEDs in the buttons via resistors. The parallel connection of the resistors on the +B line is to increase the power capacity explained in "7-2 Power Supply Circuit."

b. Lamp in the Door

The door lamp is switched on by the Door Sensor (S26). When the door opens, S26 turns off and Q1 and Q3 turn on. Acc +B is fed to the lamp and turns it on.

c. TAPE/TUNER Display

When Q6 (TAPE) or Q24 (TUNER) turns on, Acc +B is fed to Q30 via D19-1 or D19-2 and R90. Q30 turns on. Q26 – Q29 turn on. Then, +B is fed to the TAPE or TUNER LED Array. PD4050B #15 (SO) puts out data for indicating TAPE or TUNER and feeds them to PD7005 #2 (DATA). When PD7005 receives the TAPE display data, it puts H (4V) out of #28 (ILMI TAPE). Keeping the level of #28 High, it shifts #27 (ILMI TUNER) to L (0V). When it receives the TUNER display data, it puts L (0V) out of #28 keeping #27 High (4V). When #27 is H (4V), Q1 turns on and the TUNER LED array turns on. When #28 is H, Q2 turns on and the TAPE LED array turns on. Both LED arrays turn on for a short time when the TUNER or TAPE is depressed because #27 and #28 are initially H. When the Door opens, #27 and #28 shift to L (0V) and turn the LED arrays off.

d. FL Display Drive Circuit.

Fig.26 shows the FL display drive circuit.FL's filament is heated by AC. The potential at the anode and grid should be more than 10V DC higher than that at filament to turn the FL on. A DC-DC converter has been employed to obtain two voltages. One is to shift BT +B (+13.2V) to −30V. This becomes the V-negative source for displaying. Another is to obtain AC for the eight filaments. The AC is taken out of the transformer which has been coupled with the oscillator built in the converter. The V⁻ (−30V) is reduced to about −25V by the zener diode (D21). The −25V is fed to the center terminal of the transformer. Then, the DC applied to the filament becomes a pulsive DC of −25V average. When PD7005 puts out H (4V) for the anode and grid, the potential difference between the anode and cathode becomes about +29V (4V − (−25V)) and the FL turns on. Fig. 26

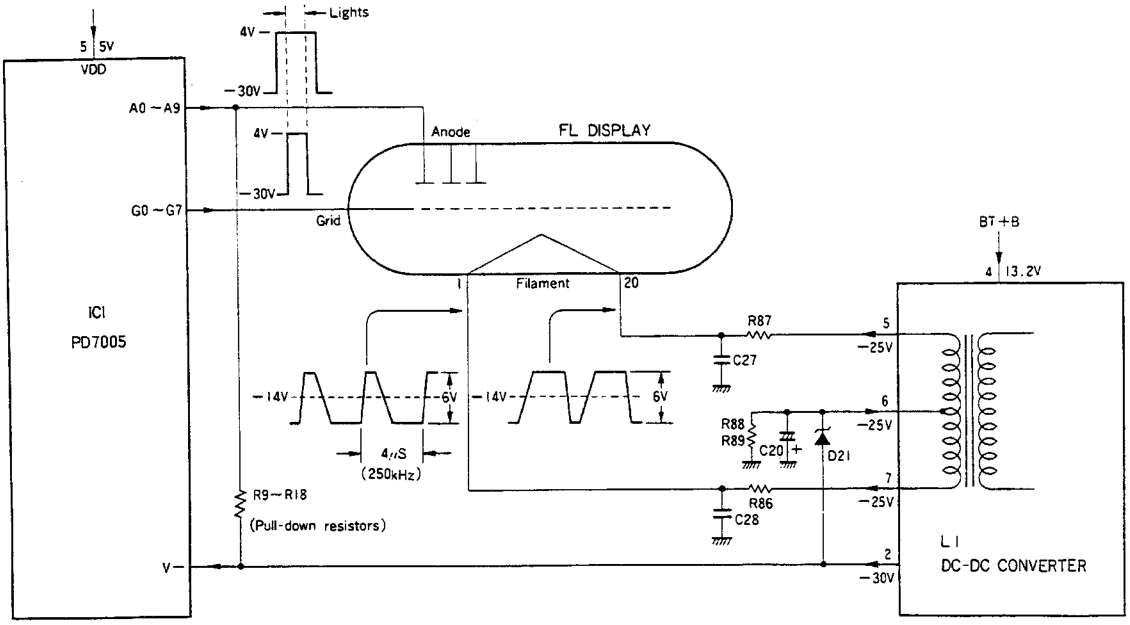


Fig. 26 FL Display Drive Circuit

e. FL Display Timing

The 80-bit display data from PD4050B are decoded and put out by PD7005 in the form of an 8-digit (grid) × 10-segment (anode). In other words, this FL display lights dynamically.

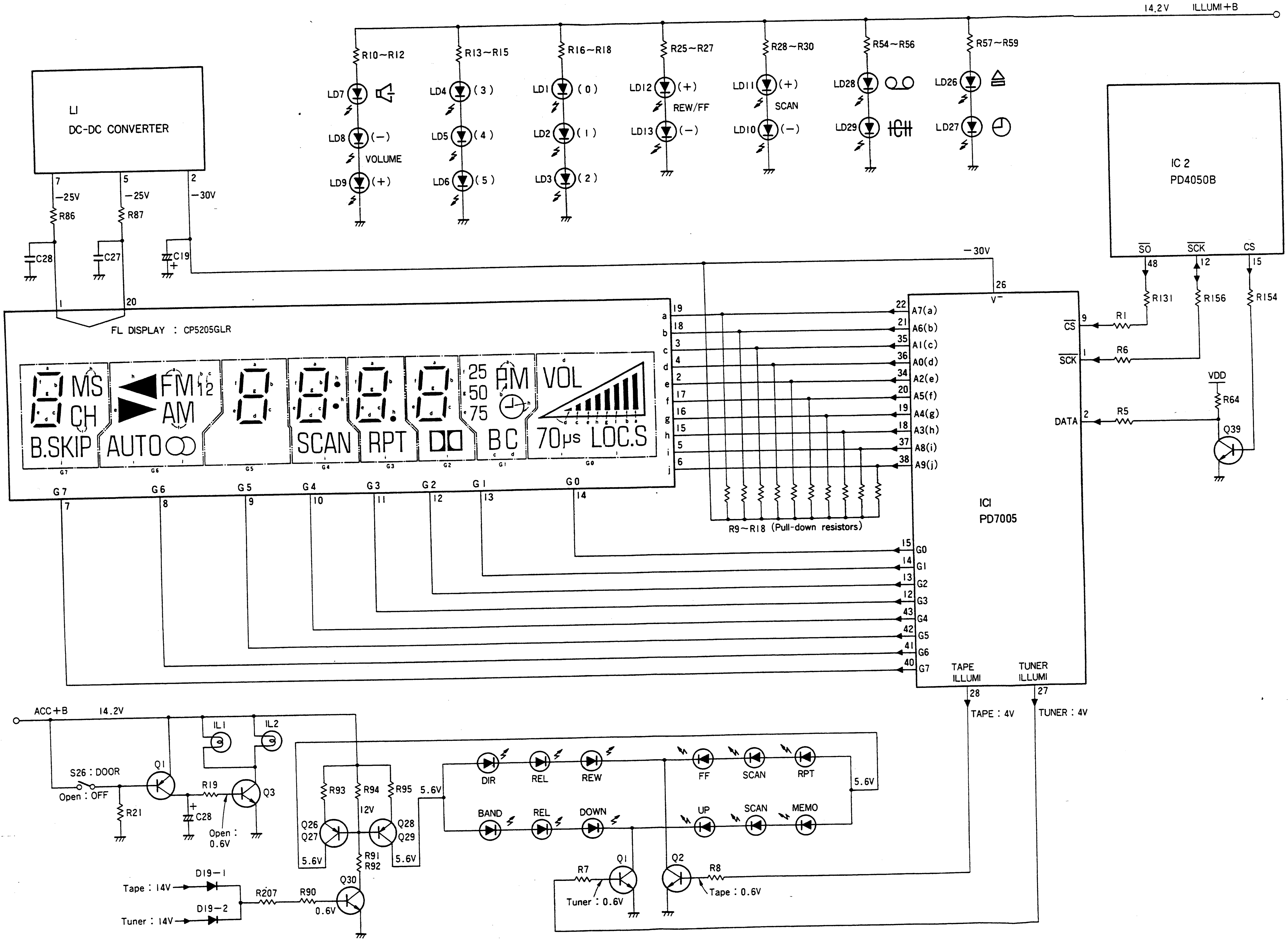

14.2V ILLUMI+B
R10~R12
R13~R15
R16~R18
R25~R27
R28~R30
R54~R56
R57~R59
LD7
LD8 (−)
VOLUME
LD9 (+)
LD4 (3)
LD5 (4)
LD6 (5)
LD1 (0)
LD2 (1)
LD3 (2)
LD12 (+)
REW/FF
LD13 (−)
LD11 (+)
SCAN
LD10 (−)
LD28
LD29
LD26
LD27
L1
DC-DC CONVERTER
7
5
2
−25V
−25V
−30V
R86
R87
C28
C27
C19
IC 2
PD4050B
SO
SCK
CS
48
12
15
R131
R156
R154
−30V
26
V⁻
1
20
FL DISPLAY : CP5205GLR
MS
CH
B.SKIP
FM
AM
AUTO
SCAN
RPT
25
50
75
PM
BC
VOL
70μs
LOC.S
a b c d e f g h i j
19 18 3 4 2 17 16 15 5 6
22 A7(a)
21 A6(b)
35 A1(c)
36 A0(d)
34 A2(e)
20 A5(f)
19 A4(g)
18 A3(h)
37 A8(i)
38 A9(j)
CS 9
SCK 1
DATA 2
R1
R6
R5
VDD
R64
Q39
IC1
PD7005
R9~R18 (Pull-down resistors)
G7 G6 G5 G4 G3 G2 G1 G0
7 8 9 10 11 12 13 14
15 G0
14 G1
13 G2
12 G3
43 G4
42 G5
41 G6
40 G7
TAPE ILLUMI
TUNER ILLUMI
28
27
TAPE : 4V
TUNER : 4V
ACC+B 14.2V
IL1
IL2
S26 : DOOR
Open : OFF
Q1
R21
R19
C28
Open : 0.6V
Q3
R93
R94
R95
5.6V
12V
Q26 Q27
Q28 Q29
5.6V
5.6V
R91 R92
Q30
D19−1
D19−2
Tape : 14V
Tuner : 14V
R207
R90
0.6V
DIR
REL
REW
FF
SCAN
RPT
5.6V
BAND
REL
DOWN
UP
SCAN
MEMO
R7
Q1
Tuner : 0.6V
Q2
R8
Tape : 0.6V

Fig. 27 Illumination and Display Circuits

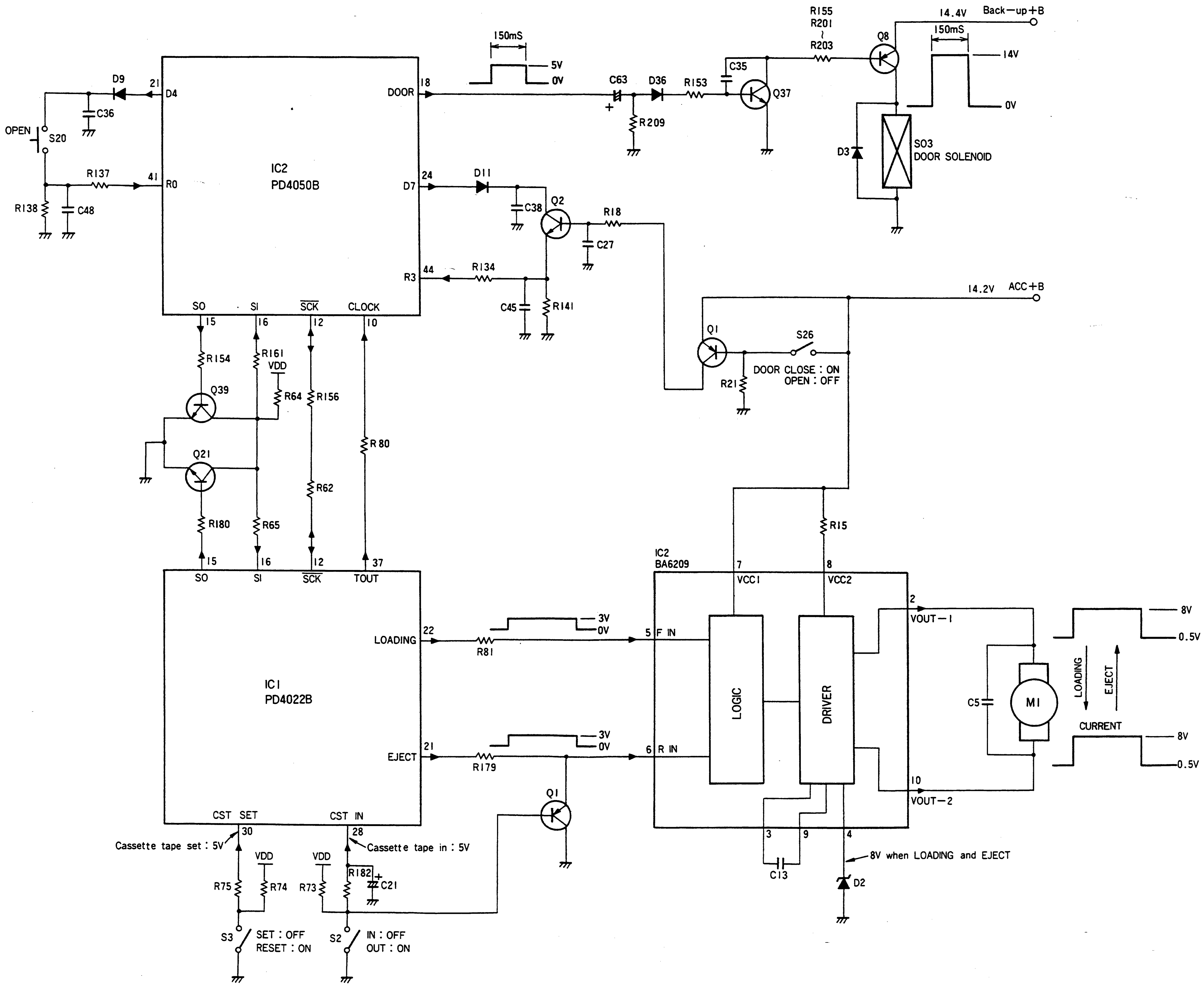

IC2
PD4050B
D4
RO
DOOR
D7
R3
SO
SI
SCK
CLOCK
21
41
18
24
44
15
16
12
10
D9
C36
OPEN
S20
R137
R138
C48
150mS
5V
0V
C63
D36
R153
C35
R209
Q37
R155
R201
~
R203
Q8
14.4V
Back—up+B
150mS
14V
0V
D3
S03
DOOR SOLENOID
D11
C38
Q2
R18
C27
R134
C45
R141
14.2V
ACC+B
Q1
S26
DOOR CLOSE : ON
OPEN : OFF
R21
R154
R161
VDD
Q39
R64
R156
Q21
R80
R62
R180
R65
IC1
PD4022B
SO
SI
SCK
TOUT
15
16
12
37
LOADING
22
EJECT
21
R81
R179
3V
0V
3V
0V
CST SET
CST IN
30
28
Cassette tape set : 5V
Cassette tape in : 5V
VDD
VDD
R75
R74
R73
R182
C21
S3
SET : OFF
RESET : ON
S2
IN : OFF
OUT : ON
Q1
IC2
BA6209
7
8
VCC1
VCC2
R15
5
F IN
6
R IN
LOGIC
DRIVER
2
VOUT—1
10
VOUT—2
3
9
4
C13
8V when LOADING and EJECT
D2
C5
M1
LOADING
EJECT
CURRENT
8V
0.5V
8V
0.5V

Fig. 28 Door-opening and Tape-loading Circuits

7.6 DOOR–OPENING AND TAPE-LOADING CIRCUITS

Here we will discuss the circuits to open the door and to load and eject the tape. The Key-input circuit of PD4050B and the communication between the PD4050B and PD4022B have already been explained. Refer to Fig. 28 for the circuit diagram.

a. Opening the Door

When the door is closed and the OPEN (S20) is depressed, PD4050B accepts the OPEN signal. Then, PD4050B puts the Door Open signal (an H pulse of 150ms) out of #18 (DOOR). This signal goes to Q37 and Q8 via C63, D36 and R153 and turns them on for 150ms. During the period Q8 is on, the Door Solenoid unlocks the door and a spring opens the door.

b. Loading a Tape

The S2 (CST IN) switch opens when a tape is loaded. V_{DD} (5V) is applied to PD4022B #28 (CST IN) via R73 and R182, and the level at pin #28 is shifted to H. Then, its #22 (LOADING) puts out a loading signal (H:5V). The signal passes through R81 and shifts BA6209 #5 (FIN) to H (3V). Then, BA6209 puts the motor drive current (8V) out of #2 ($V_{out\ 1}$) to turn the loading motor in the loading direction. The output voltage for driving the motor is determined by the Vz of the zener diode connected to BA6209 #4. #10 works in the same way.

When loading is completed, S3 (CST SET) opens and shifts PD4022B #30 (CST SET) to H (5V). The H level shifts #22 to L (0V). As the loading signal disappears, BA6209 stops putting the motor drive current out of #2 ($V_{out\ 1}$) (0.5V) and stops the motor. When PD4022B #30 shifts to H, it requests a tape operation command from PD4050B. When PD4022B receives the command from PD4050B, it starts playing the tape.

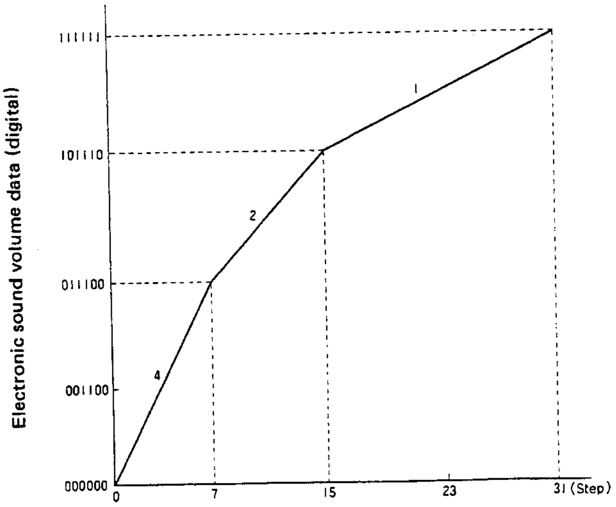
c. Tape EJECT

When OPEN (S20) is depressed during the time the door is open, PD4050B gives PD4022B an EJECT command. When PD4022A receives the EJECT command, it puts out the EJECT signal (H:5V) from pin #21 (EJECT). The signal goes to BA6209 #6 (R IN) via R179 and shifts the level at #6 to H (3V). The H level at #6 makes BA6209 put out motor drive current (8V) from #10 ($V_{out\ 2}$) to reverse the loading motor and eject the tape. As the motor turns, the tape is ejected. When the ejection is completed, S2 (CST IN) turns on. PD4022B #28 and #21 shifts to L (0V) in turn. The EJECT signal disappears and BA6209 #10 ($V_{out\ 2}$) shifts to L (0.5V) and stops putting out the motor drive signal. The motor stops. The Q1 connected to BA6209 #6 is to eliminate the shifting time lag between pins #28 and #21. Q1 turns on right after S2 turns on to shift the EJECT signal to L and stop the motor.

e. Volume Control Circuit

The sound volume is controlled by the DC voltage fed from buffer amplifier HA17358 in the Audio Unit to PA0005A #12 (CONTROL IN) in Volume Unit via R3. The DC signal is made by converting the 6-bit digital signal, which comes out of PD4050B, into an analog signal by a D-A converter made of radder resistors. The control signal can theoretically be varied in 64 steps (2^6). But, PD4050B makes 32 steps of different height (4, 2 or 1) to approximate the characteristics curve "C" of analog volume control. Fig. 30 shows the characteristic of volume control type C.

When ATT (S7) is depressed, the output level of VOLUME data is reduced to attenuate the sound volume by 20dB.



(32 steps in all because "0" has a step.)

Fig. 30 Curve "C"

7.7 AUDIO SIGNAL CONTROL CIRCUIT

Here we will discuss various control circuits concerning audio signal. Refer to Fig. 29.

a. FWD/REV

FWD/REV switching is made in TA7705P. When the cassette mechanism is in the forward mode, PD4022B #24 (FWD/REV) puts out L (0V) and when it is in the reverse mode, it puts out H (5V). This signal is fed to TA7705P #3 via R70. TA7705P turns the electronic switch to connect the forward amplifier when its pin #3 is L (0V) and to the reverse amplifier when it is H (5V).

b. EQ (Metal)

The selection of playback equalizer, normal or metal/CrO2is made automatically. The METAL switch (S1) senses the opening of 70μs on the cassette shells. PD4022B selects the PB equalizer in accordance with the signal level at pin #18 (METAL).
When a METAL or CrO2tape is loaded, S1 opens. H (5V) is fed from V_{DD} to PD4022B #18 (METAL) via R178. PD4022B puts H (5V) out of #19 when #18 becomes H. This output is fed to TA7705P #15 (NORMAL/METAL) via R68 and R14. TA7705P puts out the same signal as that of #2 (OUT) from #4 (METAL OUT). Then, R5 and R9 in the NF circuit, which determine the equalizer curve, compose a parallel circuit and make the time constant of 70μs. In the Normal mode, the time constant is 120μs without using R9. This operation is made during the period of the Automatic Tape Slack Cancel (ATSC) operation after loading a tape, and the mode is maintained until the time of ejection.

c. Dolby Noise Reduction

The level applied to PA3017 #30 (OFF/B/C) determines the type of Dolby circuit. The level is 0V, 1/2Vcc or Vcc for OFF, B or C respectively. So, the maximum input level at PA3017 #30 should be as high as Vcc or 10V. But PD4022B's H output is only 5V because its VDD is 5V.
So, a DC-DC converter composed of Q3, Q4, Q5, etc. is required to raise the voltage. When DOLBY is off, PD4022B #17 (DOLBY) is L (0V). With this L level, Q4-E is grounded by R66. Q4 and Q3 turn on. When Q3 turns on, L is fed to PA3017 #30 via R72, and the IC goes into DOLBY OFF mode. At this time, the potential at pin #30 falls down to 3V or less but not to 0V. This is because 1/2Vcc reference voltage appears at #30 when it is open. When Dolby NR B (S16) on the reverse side of the operation flap is depressed, PD4050B sends a command to PD4022B. PD4022B puts H (5V) out of #17 when it receives the Dolby B command. This H signal is fed to Q5 via R66 and D3-2 and turns Q5 on. Then, Q4 and Q3 turn off. When Q5 turns on, TAPE +B2 (9.8V) is divided by R68 and R71 and is made about 5V (1/2Vcc). This voltage is fed to PA3017 #30 via R72, and PA3017 goes into the Dolby B mode.
When the Dolby C (S17) is depressed, PD4022B receives the Dolby C command and puts its pin #17 in a high impedance state. This means that #17 is opened. So, Q3, Q4 and Q5 turn off. The TAPE +B2 (9.8V) is fed to PA3017 #30 via R68 and R72. Then, PA3017 goes into the Dolby C mode. At this time, the potential at #30 increases to 7V or a little higher but not to 9.8V. The reason for this is the same as that explained in "When Dolby is off."

d. Muting

This is an audio signal muting circuit. Let's start with the tape deck block. PD4022B #20 (MUTE) keeps H (5V) level when the mechanism is shifting or in the mode of FF, REW or MS. Then this signal goes through D17-2 and R82 and turns Q22 on. Then VDD (5V) goes to PA2014 #15 (MUTE) via D1 and R172. PA2014 mutes the audio signal when the level at #15 is shifted to H (about 3V). At the same time the VDD goes through R173, turns Q41 (Q42) on and mutes PA2014's output. When loading and ejecting, muting is also done in the same way as above with the H (5V) signal coming out of #21 or #22. When switching the TUNER on and off, PD4023 #20 (T MUTE) puts out an H (5V) pulse. The pulse goes into Q38 via R152, turns Q38 on and mutes the audio signal.
Here, we will discuss muting of the tuner circuit. PD4046B provides muting signal at pin #52 when turning the tuner on or off, scanning, manual tuning or selecting a band. The muting signal turns on Q26 and Q25. When Q25 turns on, the Backup +B is supplied via D11 and R36 to PA2014 to make pin #15 at H state, thereby muting audio signal.
The Backup +B turns on Q6 (Q7) through R37, thereby muting the audio signal, i.e. tuner output.

e. Volume Control Circuit

See page 30.

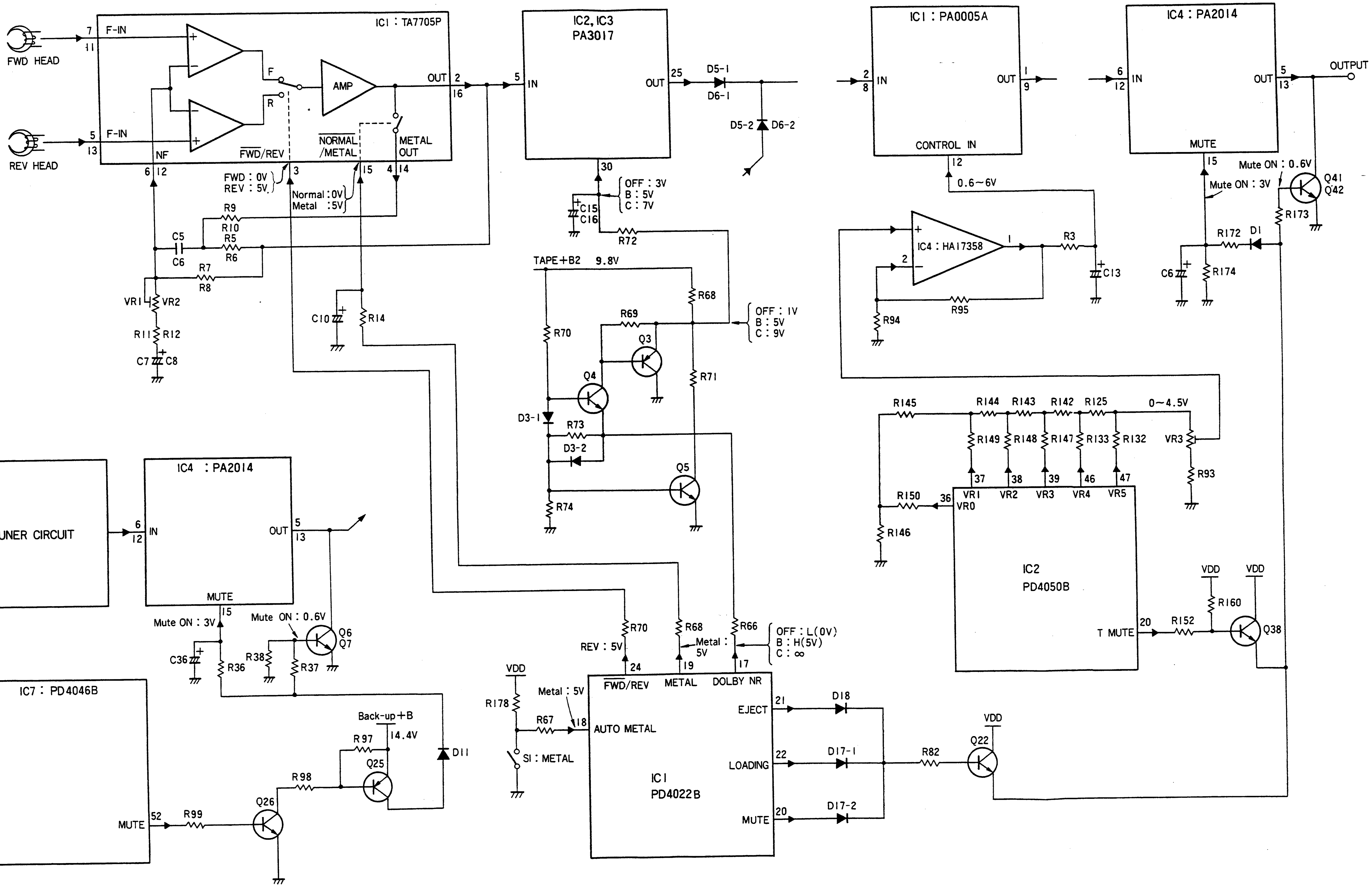

FWD HEAD
REV HEAD
IC1 : TA7705P
F-IN
F-IN
NF
AMP
OUT
FWD/REV
NORMAL/METAL
METAL OUT
FWD : 0V
REV : 5V
Normal : 0V
Metal : 5V
R9
R10
R5
R6
C5
C6
R7
R8
VR1
VR2
R11
R12
C7
C8
C10
R14
IC2, IC3
PA3017
IN
OUT
D5-1
D6-1
D5-2
D6-2
C15
C16
R72
OFF : 3V
B : 5V
C : 7V
TAPE+B2 9.8V
R68
R69
R70
Q3
Q4
R71
D3-1
R73
D3-2
Q5
R74
OFF : 1V
B : 5V
C : 9V
IC1 : PA0005A
IN
OUT
CONTROL IN
0.6~6V
IC4 : HA17358
R3
C13
R94
R95
IC4 : PA2014
IN
OUT
OUTPUT
MUTE
Mute ON : 0.6V
Mute ON : 3V
Q41
Q42
R173
R172
D1
C6
R174
R145
R144
R143
R142
R125
0~4.5V
R149
R148
R147
R133
R132
VR3
R93
R150
R146
VR1
VR2
VR3
VR4
VR5
VR0
IC2
PD4050B
T MUTE
VDD
VDD
R160
R152
Q38
TUNER CIRCUIT
IC4 : PA2014
IN
OUT
MUTE
Mute ON : 3V
Mute ON : 0.6V
Q6
Q7
C36
R36
R38
R37
IC7 : PD4046B
MUTE
R99
Q26
R98
Q25
R97
Back-up+B
14.4V
D11
VDD
R178
R67
S1 : METAL
Metal : 5V
REV : 5V
R70
R68
Metal : 5V
R66
OFF : L(0V)
B : H(5V)
C : ∞
FWD/REV
METAL
DOLBY NR
AUTO METAL
IC1
PD4022B
EJECT
LOADING
MUTE
D18
D17-1
D17-2
R82
VDD
Q22

Fig. 29 Audio Signal Control Circuit

7.8 BLOCK DIAGRAM (CONTROL SECTION)

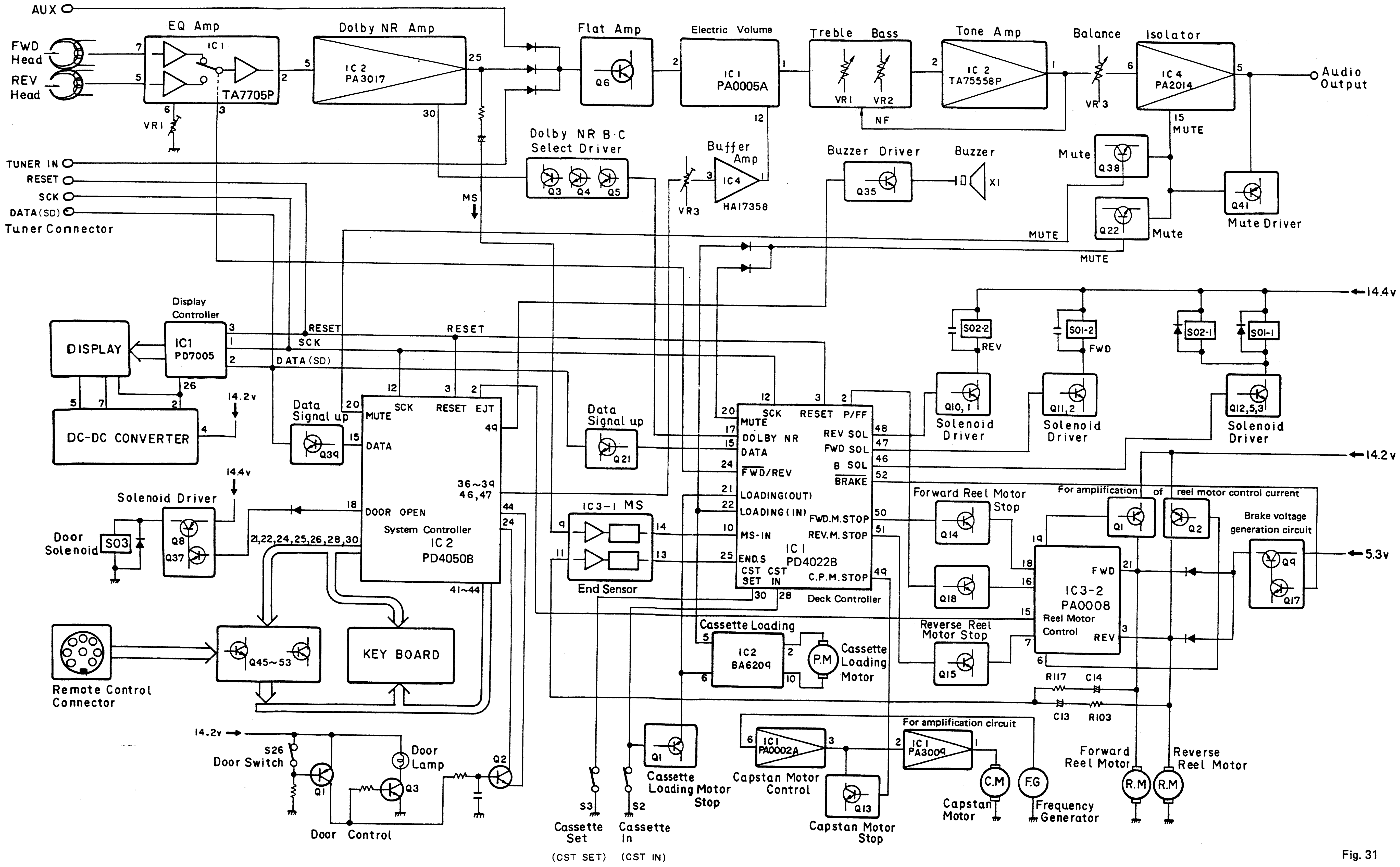

AUX
FWD Head
REV Head
EQ Amp
IC1
TA7705P
VR1
Dolby NR Amp
IC2
PA3017
Flat Amp
Q6
Electric Volume
IC1
PA0005A
Treble
Bass
VR1
VR2
NF
Tone Amp
IC2
TA75558P
Balance
VR3
Isolator
IC4
PA2014
MUTE
Audio Output
Dolby NR B·C Select Driver
Q3
Q4
Q5
Buffer Amp
IC4
HA17358
VR3
Buzzer Driver
Q35
Buzzer
X1
Mute
Q38
Q22
Mute
Q41
Mute Driver
MUTE
MUTE
TUNER IN
RESET
SCK
DATA(SD)
Tuner Connector
MS
Display Controller
DISPLAY
IC1
PD7005
RESET
SCK
DATA (SD)
RESET
DC-DC CONVERTER
14.2v
Data Signal up
Q39
MUTE
SCK
RESET
EJT
DATA
DOOR OPEN
System Controller
IC2
PD4050B
36~39
46,47
41~44
21,22,24,25,26,28,30
14.4v
Solenoid Driver
Door Solenoid
S03
Q8
Q37
Data Signal up
Q21
IC3-1 MS
End Sensor
SCK
RESET
P/FF
MUTE
DOLBY NR
DATA
FWD/REV
LOADING(OUT)
LOADING(IN)
MS-IN
END.S
CST SET
CST IN
REV SOL
FWD SOL
B SOL
BRAKE
FWD.M.STOP
REV.M.STOP
C.P.M.STOP
IC1
PD4022B
Deck Controller
14.4v
S02-2
REV
S01-2
FWD
S02-1
S01-1
Q10, 1
Solenoid Driver
Q11, 2
Solenoid Driver
Q12, 5, 3
Solenoid Driver
14.2v
Forward Reel Motor Stop
Q14
Q18
Reverse Reel Motor Stop
Q15
For amplification of reel motor control current
Q1
Q2
Brake voltage generation circuit
Q9
Q17
5.3v
IC3-2
PA0008
Reel Motor Control
FWD
REV
R117
C14
C13
R103
Cassette Loading
IC2
BA6209
P.M
Cassette Loading Motor
Remote Control Connector
Q45~53
KEY BOARD
14.2v
S26
Door Switch
Q1
Door Lamp
Q3
Q2
Door Control
S3
Cassette Set
(CST SET)
S2
Cassette In
(CST IN)
Q1
Cassette Loading Motor Stop
IC1
PA0002A
Capstan Motor Control
Q13
Capstan Motor Stop
For amplification circuit
IC1
PA3009
C.M
Capstan Motor
F.G
Frequency Generator
Forward Reel Motor
R.M
Reverse Reel Motor
R.M

Fig. 31

7.9 CASSETTE LOADING → FORWARD PLAY

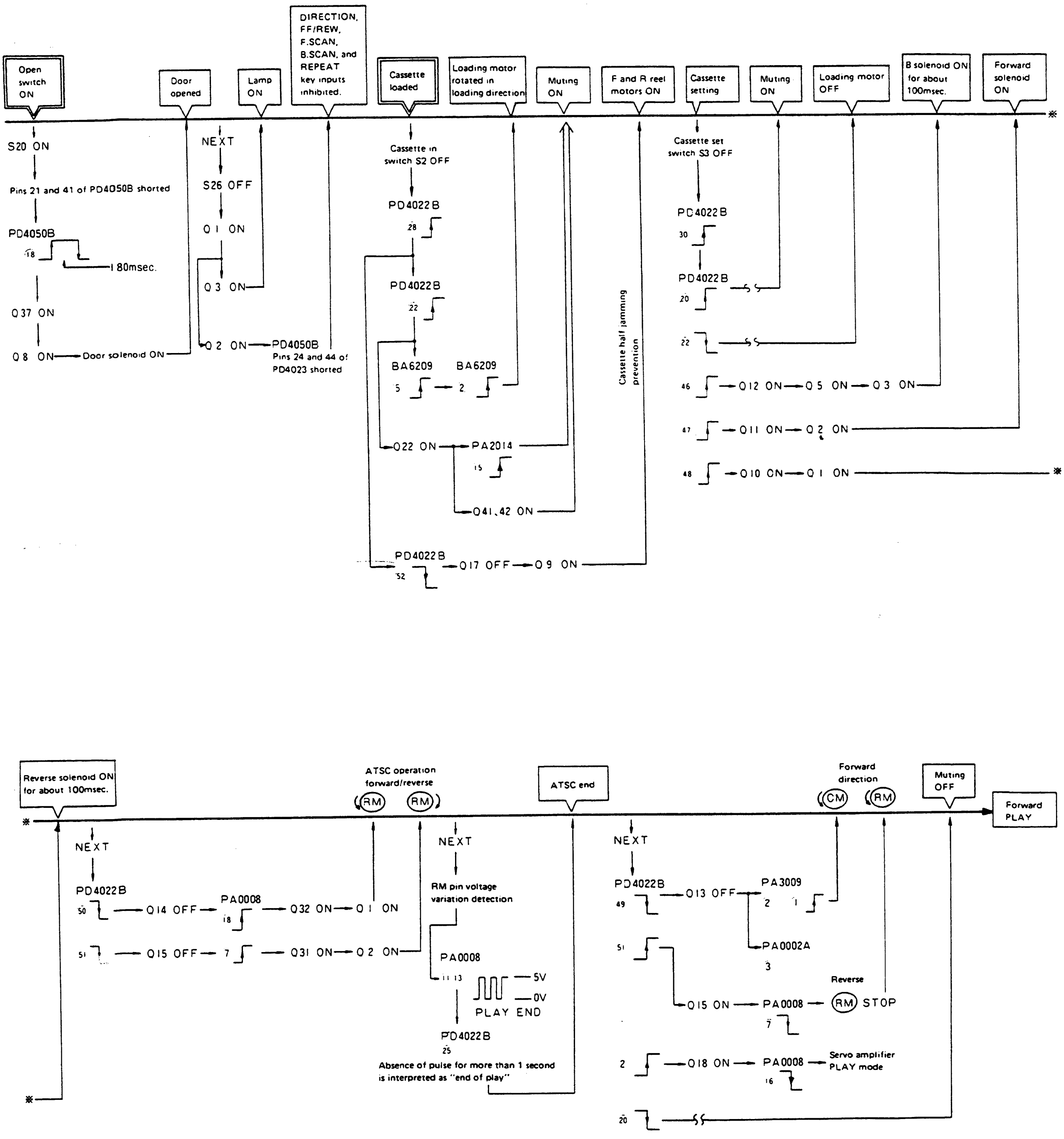
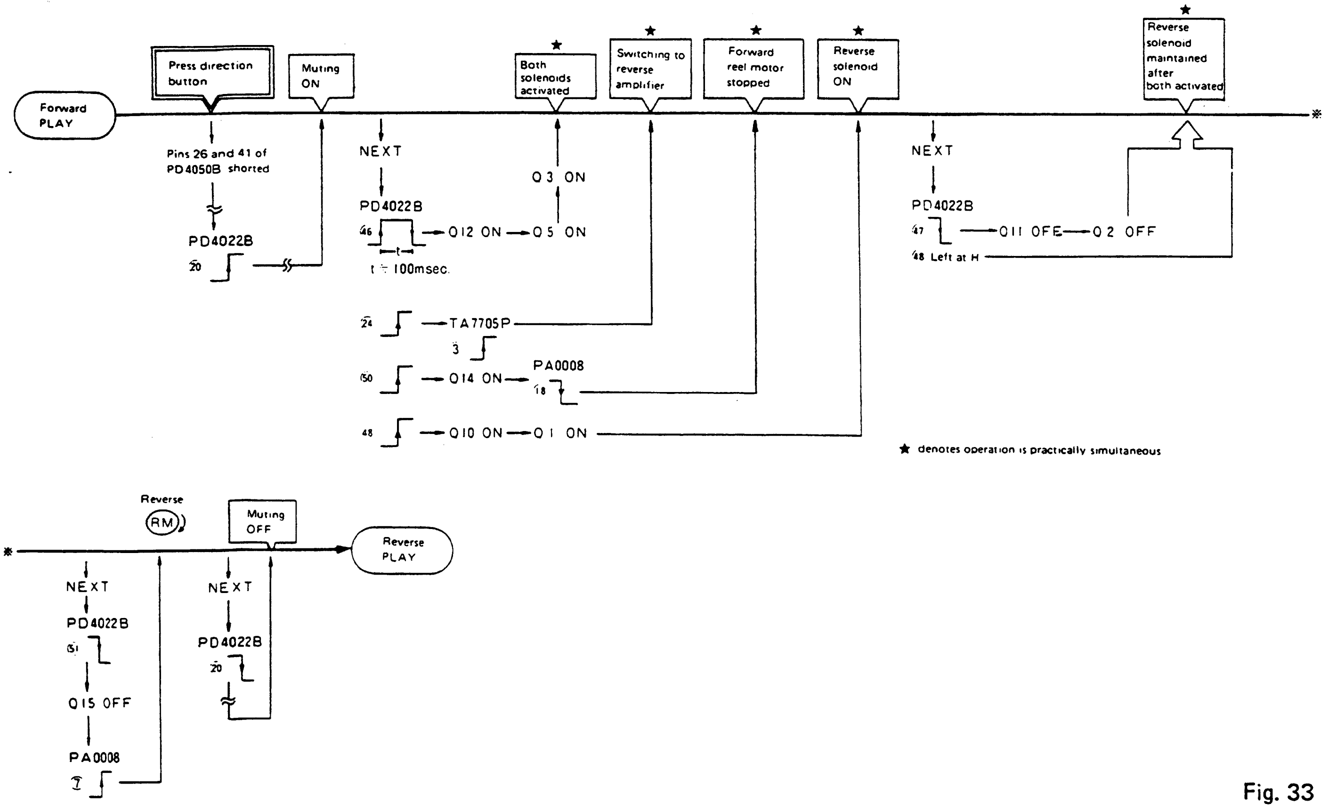

Open switch ON
Door opened
Lamp ON
DIRECTION, FF/REW, F.SCAN, B.SCAN, and REPEAT key inputs inhibited.
Cassette loaded
Loading motor rotated in loading direction
Muting ON
F and R reel motors ON
Cassette setting
Muting ON
Loading motor OFF
B solenoid ON for about 100msec.
Forward solenoid ON
S20 ON
Pins 21 and 41 of PD4050B shorted
PD4050B
18
180msec.
Q37 ON
Q8 ON
Door solenoid ON
NEXT
S26 OFF
Q1 ON
Q3 ON
Q2 ON
PD4050B
Pins 24 and 44 of PD4023 shorted
Cassette in switch S2 OFF
PD4022B
28
PD4022B
22
BA6209
5
BA6209
2
Q22 ON
PA2014
15
Q41, 42 ON
PD4022B
52
Q17 OFF
Q9 ON
Cassette half jamming prevention
Cassette set switch S3 OFF
PD4022B
30
PD4022B
20
22
46
Q12 ON
Q5 ON
Q3 ON
47
Q11 ON
Q2 ON
48
Q10 ON
Q1 ON
Reverse solenoid ON for about 100msec.
NEXT
PD4022B
50
Q14 OFF
PA0008
18
Q32 ON
Q1 ON
51
Q15 OFF
7
Q31 ON
Q2 ON
ATSC operation forward/reverse
RM
RM
NEXT
RM pin voltage variation detection
PA0008
11 13
5V
0V
PLAY END
PD4022B
25
Absence of pulse for more than 1 second is interpreted as "end of play"
ATSC end
NEXT
PD4022B
49
Q13 OFF
PA3009
2
1
PA0002A
3
51
Q15 ON
PA0008
7
Reverse
RM
STOP
2
Q18 ON
PA0008
16
Servo amplifier PLAY mode
20
Forward direction
CM
RM
Muting OFF
Forward PLAY

Fig. 32

7.10 FORWARD PLAY → REVERSE PLAY


Forward PLAY
Press direction button
Muting ON
Both solenoids activated
Switching to reverse amplifier
Forward reel motor stopped
Reverse solenoid ON
Reverse solenoid maintained after both activated
Pins 26 and 41 of PD4050B shorted
PD4022B
20
NEXT
PD4022B
46
Q12 ON
Q5 ON
Q3 ON
t ≒ 100msec.
24
TA7705P
3
50
Q14 ON
PA0008
18
48
Q10 ON
Q1 ON
NEXT
PD4022B
47
Q11 OFF
Q2 OFF
48 Left at H
Reverse
RM
Muting OFF
Reverse PLAY
NEXT
PD4022B
51
Q15 OFF
PA0008
1
NEXT
PD4022B
20

★ denotes operation is practically simultaneous

Fig. 33

7.11 FORWARD PLAY → FF

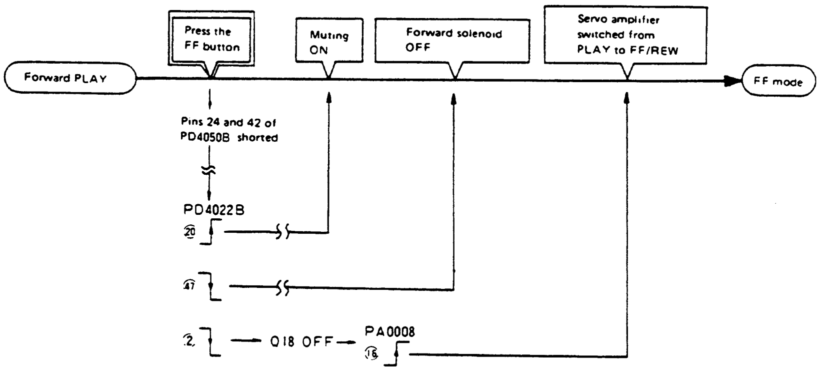

Forward PLAY
Press the FF button
Muting ON
Forward solenoid OFF
Servo amplifier switched from PLAY to FF/REW
FF mode
Pins 24 and 42 of PD4050B shorted
PD4022B
20
47
2
Q18 OFF
PA0008
15

Fig. 34

7.12 FF → F.SCAN

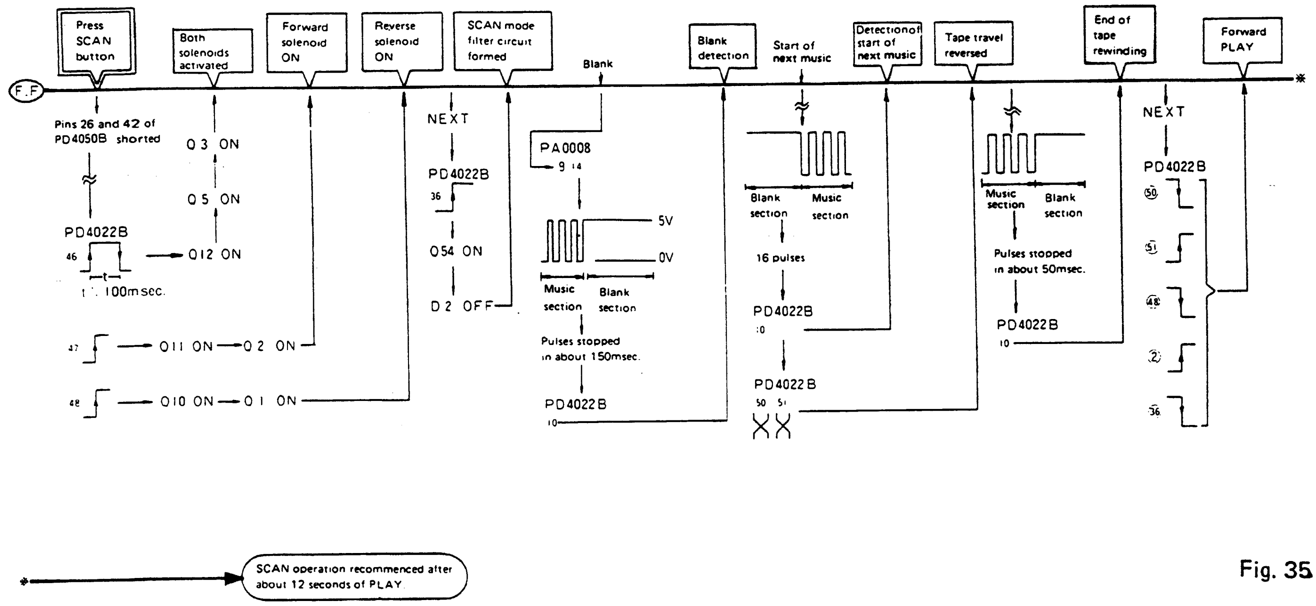

Press SCAN button
Both solenoids activated
Forward solenoid ON
Reverse solenoid ON
SCAN mode filter circuit formed
Blank
Blank detection
Start of next music
Detection of start of next music
Tape travel reversed
End of tape rewinding
Forward PLAY
F.F
Pins 26 and 42 of PD4050B shorted
Q3 ON
Q5 ON
PD4022B
46
Q12 ON
t: 100msec.
47
Q11 ON → Q2 ON
48
Q10 ON → Q1 ON
NEXT
PD4022B
36
Q54 ON
D2 OFF
PA0008
9 14
5V
0V
Music section
Blank section
Pulses stopped in about 150msec.
PD4022B
10
Blank section
Music section
16 pulses
PD4022B
10
PD4022B
50 51
Music section
Blank section
Pulses stopped in about 50msec.
PD4022B
10
NEXT
PD4022B
50
51
48
2
36
SCAN operation recommenced after about 12 seconds of PLAY

Fig. 35

7.13 MS OPERATION

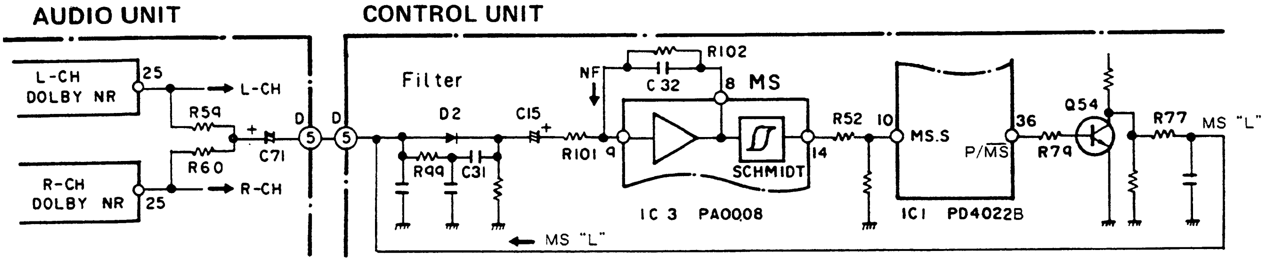

AUDIO UNIT
CONTROL UNIT
L-CH DOLBY NR
25
L-CH
R59
R60
C71
R-CH DOLBY NR
25
R-CH
D
D
5
5
Filter
D2
C15
R99
C31
NF
R102
C32
8
MS
R101
9
14
SCHMIDT
IC 3 PA0008
R52
10
MS.S
36
P/MS
IC1 PD4022B
Q54
R79
R77
MS "L"
MS "L"

Fig. 36

This circuit is used to detect unrecorded portions of tape. Circuit composition is much the same as the stationary reel base detector circuit.

An LR output signal is generated in the Dolby NR circuit and is passed via a filter circuit to pin 9 of IC3. A Schmidt circuit generates a pulse output synchronized with recorded portions of tape (recorded at above a certain level). The presence/absence of this pulse train is detected in IC4 and is used as the basis for the music selection operation.

The filter is used to switch the frequency response and gain for music selection at play speed and high speed.

7.14 STATIONARY REEL BASE DETECTION (Fig. 37)

This mechanism detects the fact that both motors have stopped, and is used in detecting the end of tape and the end of ATSC (for taking up tape slack). The circuit consists of a differential high gain END SENSE AMP and a Schmidt circuit block. The END SENSE AMP non-inverted input is fixed at a reference voltage level inside the IC, while the inverted input is passed to an external circuit.

During all modes, current is passed through one motor or the other. And while either motor is operating, the motor pin voltage is changed in synchronization with the brush/commutator switching. When the motors are stationary, the voltage remains at a constant level. In other words, the end of tape condition can be detected by detecting changes in this motor pin voltage.

The motor voltage is AC amplified by the END SENSE AMP, and if the amplified output is greater than the Schmidt circuit hysteresis width, the Schmidt circuit is activated. A pulse output synchronized with changes in the motor pin voltage is generated and passed to IC1. Therefore, the generation of output pulses indicates that the motor is operating, while the absence of pulses indicates that the motor is stationary.

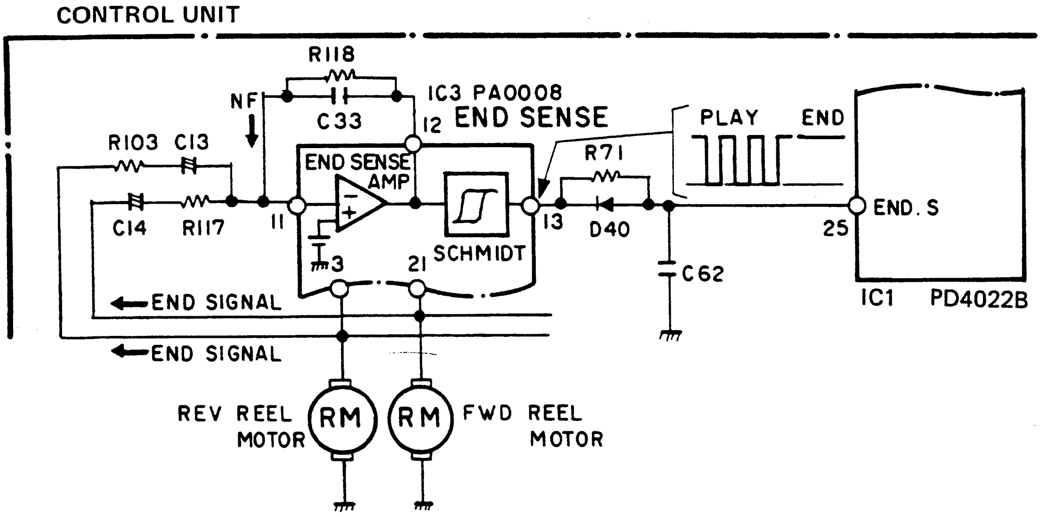


Fig. 37

7.15 PLAY MODE

During PLAY mode, constant current is supplied to the motor to generate constant torque in the take-up reel. IC 3 (PA0008) includes a PLAY CURRENT setting block which sets the reference current during PLAY mode, CURRENT AMP 21 which compares the motor current with the reference current, and another amplifier CURRENT AMP 22 used for current amplification purposes.

The motor is driven by constant current obtained by a feedback loop which equalizes the voltage drop generated by current (motor current) being passed through R8 with the voltage drop across R108 (reference voltage) generated by passing the reference current through the reference resistance R108.

If, say, the motor current decreases, resulting in the voltage drop across R8 becoming smaller than the voltage drop across R108, a positive input is applied to CURRENT AMP 21 and the output current is amplified. This output current is inverted and amplified by CURRENT AMP 22, resulting in the Q2 base current being amplified. Therefore, the Q2 collector current is also increased, resulting in a larger voltage drop across R8. In this way, the voltage drops across R8 and R108 are kept equal to ensure a constant motor current.

7.16 PLAY MODE REEL MOTOR "OVER SPEED" DETECTION (Fig. 38)

During PLAY mode, the motor is driven by a constant current, the motor rpm speed being controlled by the tape speed achieved at the capstan. If the tape should happen to break, however, thereby eliminating the rpm control, the rpm speed will be accelerated by the PLAY torque, and the motor counter electromotive voltage and pin voltage will increase to a level approaching the circuit supply voltage. This motor voltage is detected by the PLAY MOTOR OVER SPEED DETECTOR block and if it exceeds a reference voltage Vs (approx. 6.5V), a signal is generated at the EJT pin to initiate tape ejection.

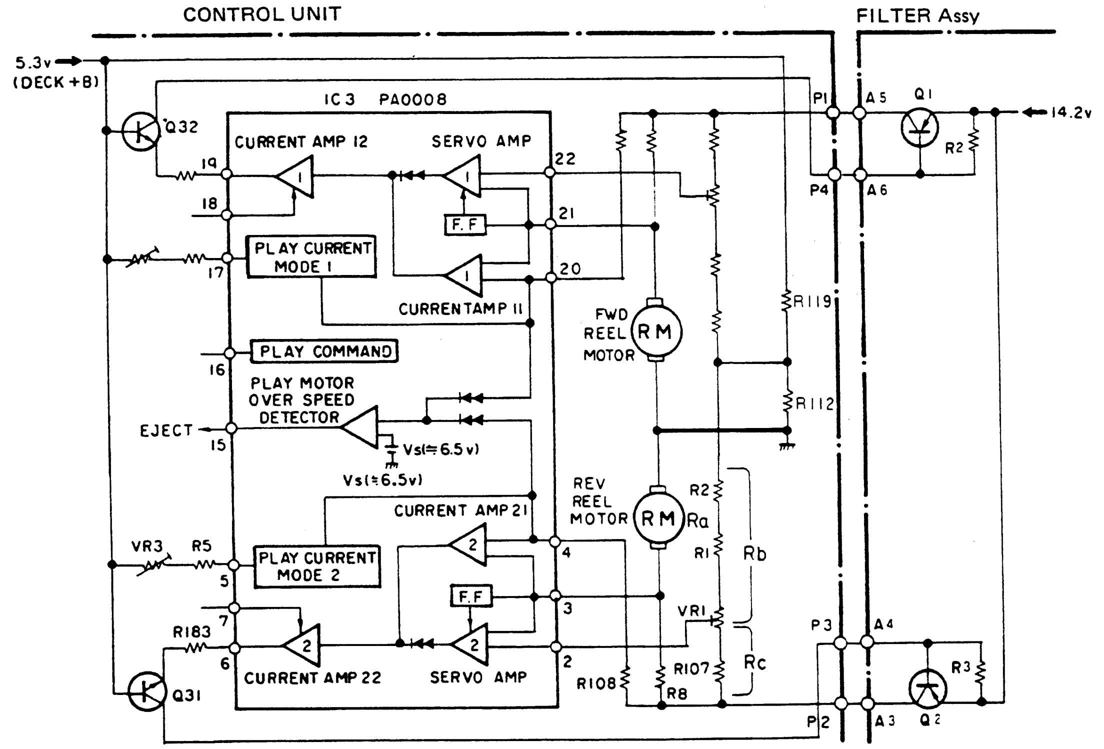

CONTROL UNIT
FILTER Assy
5.3v
(DECK +B)
Q32
IC3 PA0008
CURRENT AMP 12
SERVO AMP
19
18
22
21
20
F.F
PLAY CURRENT MODE 1
17
CURRENTAMP 11
PLAY COMMAND
16
PLAY MOTOR OVER SPEED DETECTOR
EJECT
15
Vs(≒6.5v)
CURRENT AMP 21
VR3
R5
PLAY CURRENT MODE 2
5
4
3
2
R183
7
6
CURRENT AMP 22
SERVO AMP
Q31
FWD REEL MOTOR
RM
REV REEL MOTOR
Ra
R2
R1
Rb
VR1
Rc
R107
R8
R108
R119
R112
P1
P4
P3
P2
A5
A6
A4
A3
Q1
Q2
R2
R3
14.2v

Fig. 38

7.17 FF/REW AND MS MODES

A constant speed servo is applied to the motor during FF and REW modes. And by introducing a slight load gradient, the motor rpm speed is decreased at a fixed rate as the motor load is increased. Consequently, the tape travel speed can be kept at a constant value irrespective of the winding diameter on the take-up reel. The motor speed control in this case is handled by a bridge servo, and for this purpose the IC also includes a differential amplifier SERVO AMP and a CURRENT AMP for amplification of the SERVO AMP output. Externally, the IC is connected to a bridge circuit with the motor armature coil resistance (Ra) forming one of the arms to enable the circuit to detect the motor rpm speed. Constant current from the deck +B line is passed to R112 to generate a reference voltage Vref across that resistor. The bridge resistance values are set so that

R8 x Rb = Ra x Rc

If the motor rpm speed should happen to decrease, resulting in a motor counter electromotive voltage Ea lower than the reference voltage Vref, a positive voltage is applied to the servo amplifier input to amplify the output from that amplifier. This output is inverted and amplified by CURRENT AMP 22, resulting in the Q2 base current also being amplified. The collector current is consequently amplified and the motor is accelerated. The motor counter electromotive voltage Ea is thereby increased as the motor rpm speed is increased. In other words, the motor finally settles down at a constant rotational speed where Ea and Vref are practically equal.

In this arrangement, however, there is no decrease in rpm speed when the motor load is increased. For this reason, the bridge balance is offset a little (that is, R8 x Rb is set to a value lower than Ra x Rc) to enable error to be generated in the bridge detector voltage when the motor current is increased (as a result of the increasing load).

In other words, the apparent motor counter electromotive voltage Ea is increased in response to load increases, thereby enabling a decrease in the motor rpm speed to be achieved. The same mechanism takes effect during MS mode.

7.18 CAPSTAN MOTOR CONTROL

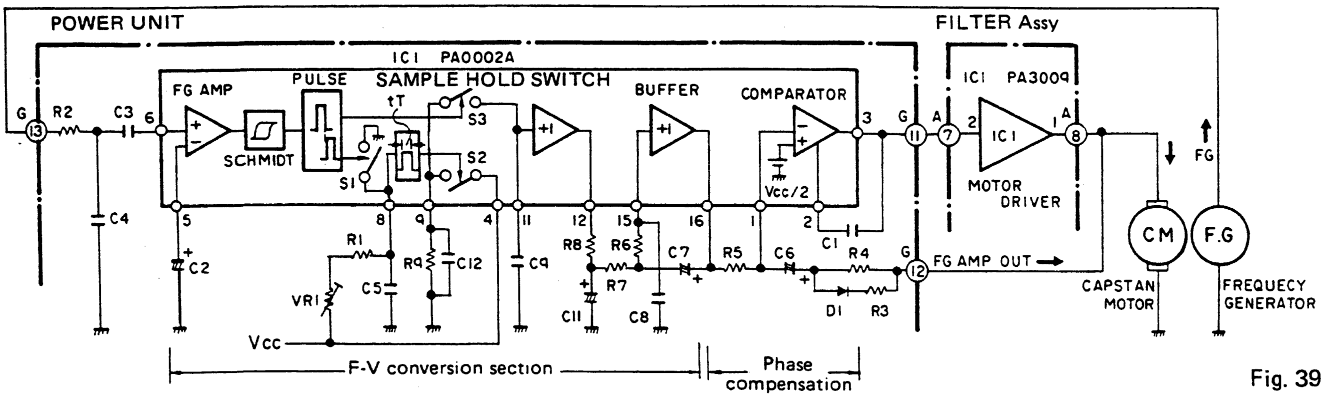

POWER UNIT
FILTER Assy
IC1 PA0002A
FG AMP
PULSE
SAMPLE HOLD SWITCH
BUFFER
COMPARATOR
SCHMIDT
tT
S1
S2
S3
Vcc/2
IC1 PA3009
IC1
MOTOR DRIVER
FG
G
R2
C3
C4
C2
R1
VR1
C5
R9
C12
C9
R8
R6
R7
C11
C8
C7
R5
C6
C1
R4
D1
R3
Vcc
FG AMP OUT
CAPSTAN MOTOR
CM
F.G
FREQUECY GENERATOR
F-V conversion section
Phase compensation

Fig. 39

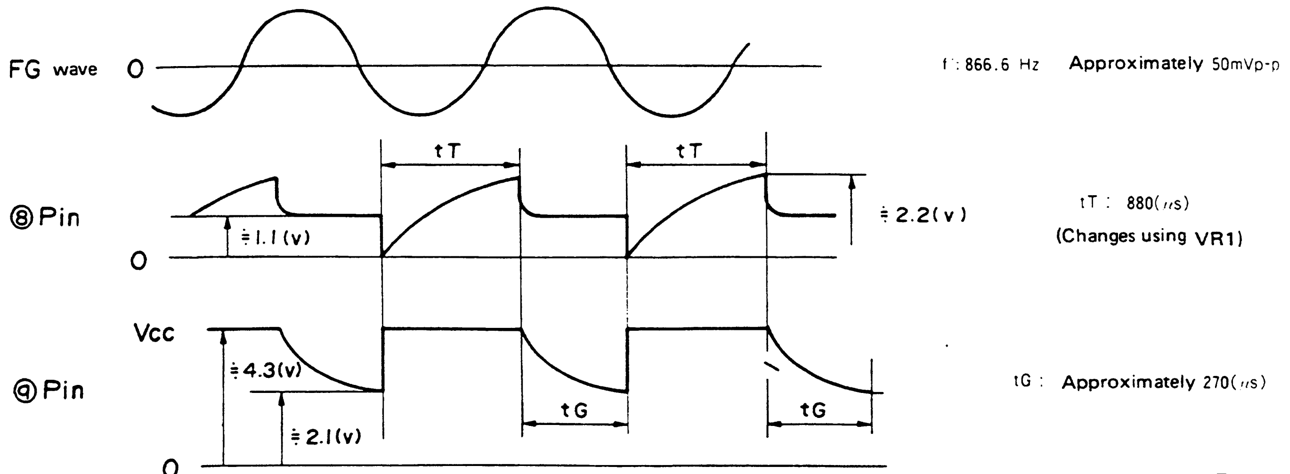


Fig. 40

The signal from the motor FG (Frequency Generator) is amplified by the FG AMP and passed to the wave forming Schmidt circuit where a complete pulse is formed. The trailing edge of that pulse is used to form the first pulse, while the trailing edge of the first pulse is used in turn to form the second pulse. The first pulse is used to switch the sample hold switch (S3) ON, and the second pulse is used to increase F – V sensitivity, thereby switching the discharge switch (S1) ON in the circuit which forms constant time intervals by use of a charging/discharging circuit.

The second pulse is applied to a later stage charging/discharging circuit to switch S1 ON/OFF. Pin 8 is charged up according to the time constant determined by C5 and R1 + VR1, and when the Schmidt circuit threshold is exceeded, the Schmidt circuit is inverted. When S1 is switched ON, the charge on C5 is discharged instantly, thereby inverting the Schmidt circuit again. With S1 being switched ON and OFF like this, the Schmidt circuit connected to the charging/discharging circuit generates constant interval pulses, and the next stage S2 is switched ON during this fixed interval.

When S2 is switched ON, C12 is charged up to Vcc instantly. And when S2 is switched OFF, the charge on C12 is discharged according to the time constant determined by C12 and R9. Since S3 is switched ON by the first pulse while C12 is still being discharged, the voltage information at pin 9 is transferred to C9. This is followed immediately by S3 being switched OFF, and S1 and S2 being switched ON in succession, thereby charging C12 up immediately to the Vcc level again. This operation is repeated over and over.

Although the widths of the first and second pulses remain unchanged if motor rotation is speeded up, the Schmidt circuit output pulse frequency is increased. In other words, since the first and second pulse cycle periods are reduced, the S2 OFF interval is shortened. This means that C12 is discharged for a shorter period of time,and the resultant higher voltage is transferred to C9.

Since negative characteristics apply between pin 11 and the motor pin, an increase in the C9 voltage results in the motor speed being decreased, thereby enabling the speed to be controlled.

To prevent C9 discharging beyond pin 11, the discharge voltage is passed through a high impedance buffer section and through to a comparator amplifier. With a reference voltage of Vcc/2 in the comparator section, the inverted input voltage is compared, and any increase or decrease in voltage is used to control the motor speed.

If the inverted input voltage is greater than the reference voltage, a negative voltage is applied to reduce the comparator output current, thereby slowing down the motor speed. Hence, since the motor will operate at maximum speed if the C9 charging quantity (comparator inverted input) is 0, there is no need for a special activator circuit when the power supply is activated. The amount of charge on C9 is about Vcc/2 when constant tape travel speed is reached.

Rpm speed can be adjusted by VR1. If the resistance is lowered, the C5 charging time constant is decreased, resulting in S2 being ON for a shorter period of time (and being OFF for a longer period of time). Therefore, a smaller charging voltage transferred to C9, and the motor speed is subsequently increased.

7.19 PROTECTOR CIRCUITS

Protector circuits are used to guard against the following five problems.

1. If the tape should happen to break during PLAY mode and reel motor "runaway" condition is detected, tape operations are stopped for two seconds before switching to ATSC operation.
2. If the ATSC operation is not completed within ten seconds, ATSC is suspended and tape operations are halted. The cassette tape is then ejected, and normal operation can be resumed if another cassette tape is loaded.
3. If the end of tape is detected four times within ten seconds, the deck is stopped to protect the mechanism. Normal operations can be resumed by pressing the TAPE button.
4. Transmission data error detection

   The system featured in this deck involves constant transfer of data between four ICs.

   If noise is generated in the data transmission line resulting in data transfer error, the deck and tuner are both stopped for two seconds and then restored to the condition prior to the generation of noise.

   Note: If the deck or tuner is switched to scanning, frequency UP/DOWN, start of tape search etc just before generation of the transfer error, that selected operation is not restored after the two second stop. Instead, the deck is restarted in PLAY mode, and the tuner is returned to "last direction" reception.
5. If cassette loading or unloading operation takes more than the normal two seconds, the current operation is reversed (that is, unloading is changed to loading, and loading is changed to unloading). If the cassette is caught somewhere, and neither ejection nor insertion is possible after switching to loading and unloading mode three times, the deck is stopped.

7.20 LEVEL DIAGRAM

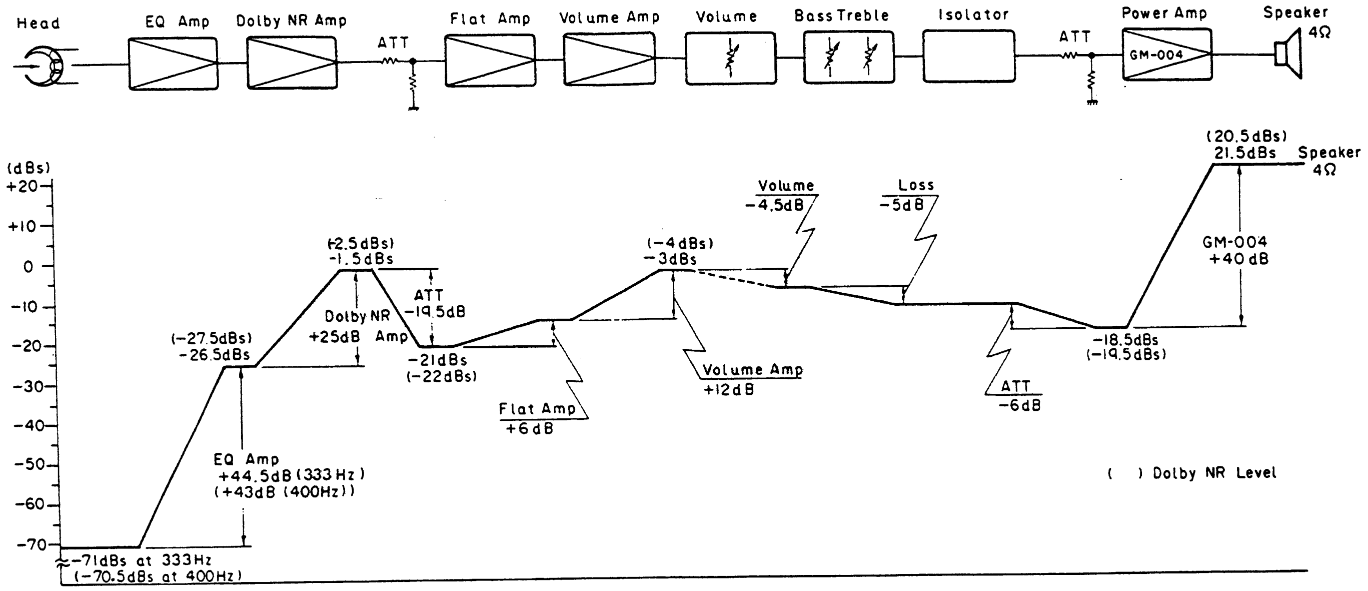

Head
EQ Amp
Dolby NR Amp
ATT
Flat Amp
Volume Amp
Volume
Bass Treble
Isolator
ATT
Power Amp
GM-004
Speaker
4Ω
(dBs)
+20
+10
0
-10
-20
-30
-40
-50
-60
-70
-71dBs at 333Hz
(-70.5dBs at 400Hz)
EQ Amp
+44.5dB (333 Hz)
(+43dB (400Hz))
(-27.5dBs)
-26.5dBs
(+2.5dBs)
-1.5dBs
Dolby NR Amp
+25dB
ATT
-19.5dB
-21dBs
(-22dBs)
Flat Amp
+6dB
(-4dBs)
-3dBs
Volume Amp
+12dB
Volume
-4.5dB
Loss
-5dB
ATT
-6dB
-18.5dBs
(-19.5dBs)
GM-004
+40dB
(20.5dBs)
21.5dBs
Speaker
4Ω
( ) Dolby NR Level

Fig. 41

7.21 BLOCK DIAGRAM (TUNER SECTION)

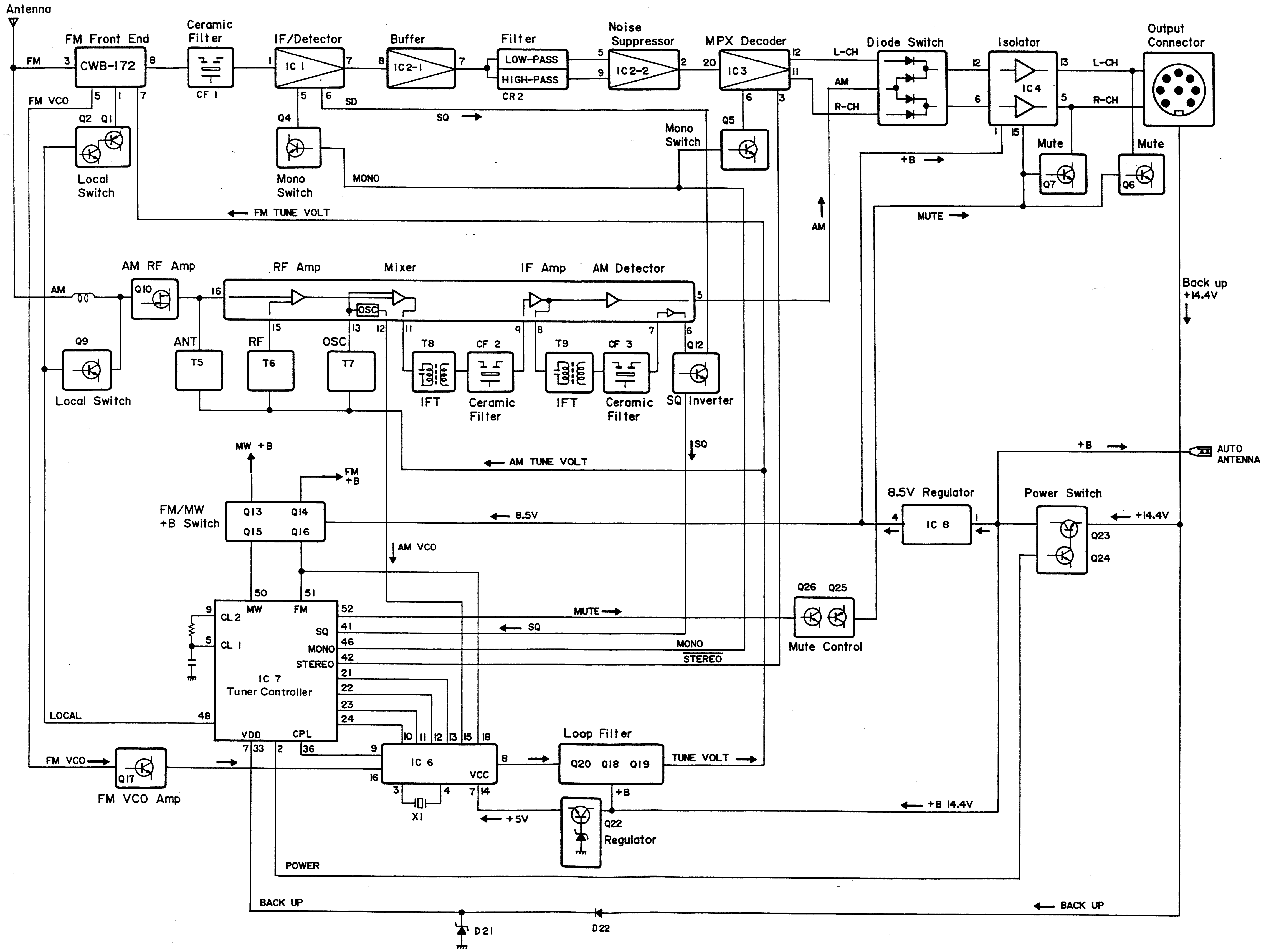

Antenna
FM
FM Front End
CWB-172
3
8
5
1
7
FM VCO
Q2 Q1
Local Switch
Ceramic Filter
CF 1
IF/Detector
IC 1
1
7
5
6
SD
Q4
Mono Switch
MONO
Buffer
IC2-1
8
7
Filter
LOW-PASS
HIGH-PASS
CR 2
SQ
Noise Suppressor
IC2-2
5
9
2
MPX Decoder
IC3
20
12
11
6
3
Q5
Mono Switch
L-CH
AM
R-CH
Diode Switch
Isolator
IC4
12
6
13
5
1
15
L-CH
R-CH
Output Connector
Mute
Q7
Mute
Q6
+B
MUTE
AM
FM TUNE VOLT
AM RF Amp
Q10
AM
16
RF Amp
Mixer
OSC
IF Amp
AM Detector
5
15
13
12
11
9
8
7
6
Q9
Local Switch
ANT
RF
OSC
T5
T6
T7
T8
CF 2
T9
CF 3
Q12
IFT
Ceramic Filter
IFT
Ceramic Filter
SQ Inverter
SQ
AM TUNE VOLT
Back up +14.4V
MW +B
FM +B
FM/MW +B Switch
Q13
Q14
Q15
Q16
8.5V
AM VCO
+B
AUTO ANTENNA
8.5V Regulator
IC 8
4
1
Power Switch
Q23
Q24
+14.4V
50
51
9
5
CL 2
CL 1
MW
FM
52
41
46
42
21
22
23
24
SQ
MONO
STEREO
IC 7
Tuner Controller
LOCAL
48
VDD
CPL
7
33
2
36
MUTE
SQ
MONO
STEREO
Q26 Q25
Mute Control
10
11
12
13
15
18
9
IC 6
16
VCC
3
4
7
14
X1
8
Loop Filter
Q20 Q18 Q19
TUNE VOLT
+B
Q22
Regulator
+5V
+B 14.4V
FM VCO
Q17
FM VCO Amp
POWER
BACK UP
BACK UP
D21
D22

Fig. 42

7.22 AM TUNER SECTION

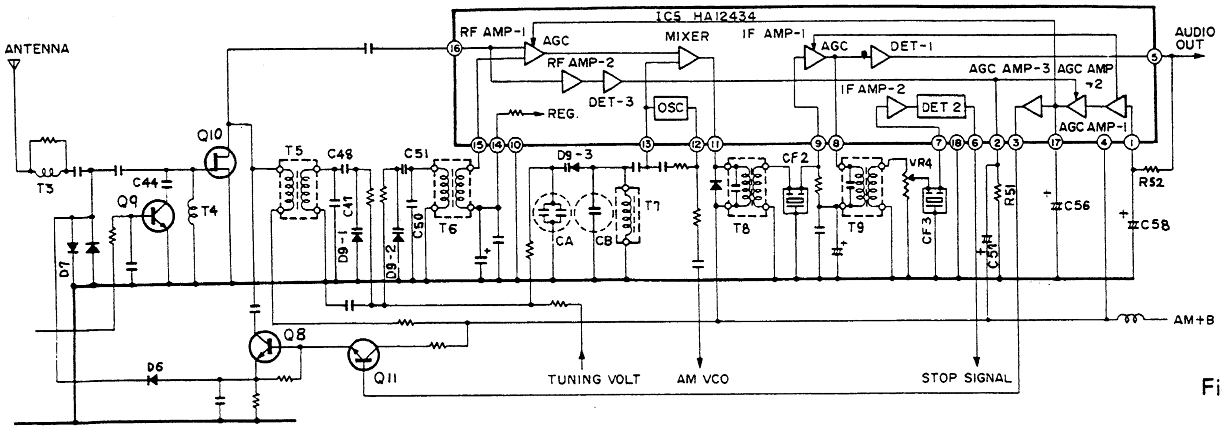


Fig. 43

IC HA12434 used in this unit is designed for electronic tuning and provided with the output circuit of the stop signals for seeking and VCO buffer. Its feature includes a wide-band AGC.

1. **RF amplifier section**
   This section performs a single-tuning 2-stage RF amplification. The first stage is a narrow-band amplifier section consisting of Q10 and its load, i.e., resonance circuit (inductance of T5, and capacitance of varicap diode D9-1, C47). The second stage is a section consisting of RF amplifier 1 inside the IC and its load, or resonance circuit (inductance of T6, and capacitance of D9-2, C50). Pin 15 is not only a terminal lead to which the load of RF amp 1 is connected, but also an input terminal pin of the mixer input.

2. **VCO section**
   The VCO (voltage-controlled oscillator) oscillates at its resonant frequency by the feedback circuit from pin 12 to pin 13 and the resonant circuit connected to pin 13. The resonant frequency is determined by the inductance of T7 and the composite capacitance of CA, CB, and D9-2. CA is a padding capacitor connected in series with capacitance-varying varicap diode D9-3, and CB is a capacitor connected in parallel with varicap diode depending on its grade. All this contributes to better tracking with the RF stage.

3. **Mixer section**
   The VCO output frequency from the VCO section and the input signal from RF amp 1 are mixed together at the mixer section to produce the IF component (450 kHz).

4. **IF section**
   The intermediate frequency section consists of the IF filter (450 kHz) by T8 and CF2, the IF amp 1 and the IF filter by T9. Pin 8 is not only a load connecting terminal of the IF amp but also an input terminal of detector circuit 1.

5. **Detector section**
   Pin 8 is connected to the detector and provides an output to pin 5, audio output. This output contains both audio frequency component (AC) and DC component.

6. **AGC section (AGC by the reception frequency)**
   The DC component of the detector output at pin 5 is detected by AGC amp 1 at pin 1 by passing it through the filter consisting of R52 and C58. The AGC starts operating at an input level close to the maximum sensitivity. The output of AGC amp 1 is connected to AGC amp 2, and controls the gain of RF amp 1.
   The AGC voltage is developed at pin 3 through AGC amp 3, and current flows through D6 and D7, lowering the impedance. As a result, attenuation is effected.
   When Q8 turns on and the load impedance of the drain of Q10 is lowered, attenuation is effected. These attenuations due to the decrease in impedance enable AGC operation. The input level to develop a voltage at pin 3 is about 55dBμV during reception of MW 999kHz. Thanks to the AGC operation mentioned above, the output variation characteristics against input variation are broader than the conventional AM characteristics.

7. **AGC section (wide-band AGC)**
   The wide-band AGC is to control the gain of the RF amplifier section when the input RF level at pin 16 is high. This is intended to prevent interference due to the saturations of RF amp Q10, RF amp 1 in the IC, etc. Caused by a large input other than the reception frequency.
   Operation is as follows: A DC voltage corresponding to the level of the input RF is developed at pin 2 by amplifying and detecting the RF signal from pin 16 by RF amp 2 and detector 3 respectively. This is delayed by the time constant of C57 and the gain of this portion is determined by R51. By applying this DC voltage to AGC amp 2, the AGC at RF amp 1 and AGC at Q8, D6 and D7 are effected.

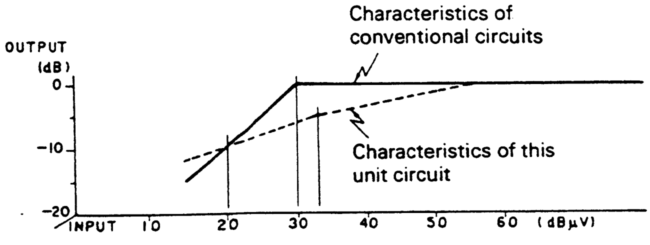


Fig. 44

8. **Stop signal**
The stop signal for seek operation is produced by extracting the IF signal from the secondary winding of T9 and adjusting its level by VR4. This signal is connected via 450kHz filter CF3 from pin 7 to IF amp 2 to detector2. This output appears at pin 6 and becomes 0V during reception.

9. **Local station/distant station seek**
During local station seek, Q9 turns on, whereby C44 is grounded. The impedance of C44 allows attenuation in the antenna system.

7.23 FM TUNER SECTION

• Front End

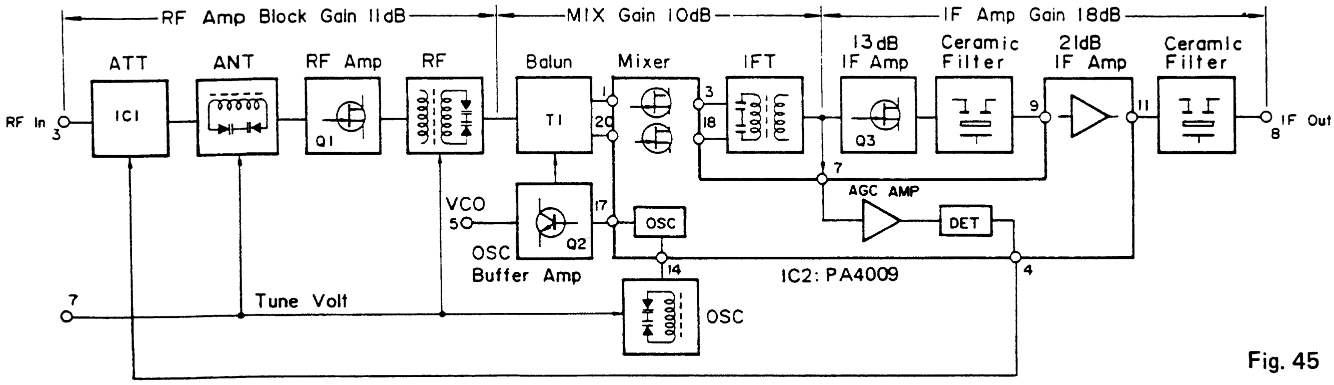


Fig. 45

The RF signal from the antenna passes through an attenuator constructed as a band-pass filter and is sent to the pi-shaped matching circuit, where high-end spurious response is improved. The signal then goes to the next stage, the RF amp. The RF amp employs a MOS FET capable of handling a wide dynamic range. The output from the RF amp passes through a parallel resonance circuit, is converted to a balanced signal from an unbalanced by a balun circuit and then goes to the mixer stage. This is a J-FET single balance type mixer which can accommodate a wide dynamic range. One of the IF signals from the mixer passes through the IF amp and ceramic filters. Another IF signal goes to the AGC amp. This AGC amp can operate even in the presence of interference signals. The AGC amp output is fed back to the RF attenuator circuit, forming a wide loop AGC. The AGC circuit operates at antenna input levels above 65 ±5dB.

• IF Amplifier and Detector

The IF signal (10.7MHz) output from the FM front-end is passed via a ceramic filter (CF1) to pin 1 of the IF amplifier detector IC1 (PA0013).

When there is no signal during the scanning operation, an output of 2 to 3V is obtained from pin 6 of IC1. Q12 is thus turned on, resulting in pin 41 of the control IC (IC7) being set to 0V to ensure that scanning is continued. When an input signal is received, pin 6 of IC1 is set to 0V, pin 41 of IC7 is set to "H", and scanning is stopped. A DC voltage which varies according to the level of the input signal is obtained from pin 17 of IC1, and is applied to pins 18 and 19 (stereo decoder output high-cut control pins) and pin 17 (separation pin) of IC3 (PA0015).

• PNS Circuit

IC2 (PA0014) is the FM noise canceller IC.

• FM MPX Circuit

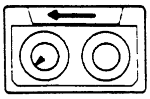
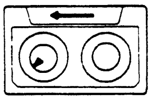
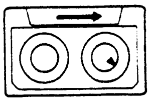
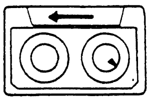
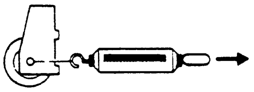
IC3 (PA0015) is the PLL FM multiplex stereo decoder IC. When the composite stereo input signal accompanying the 19kHz pilot signal is applied, the VCO in the IC is locked to 19kHz and separates the left and right channel signals by the 38kHz switching signal.

• ARC MKV

In contrast to the earlier ARC MKIII (revised), control of separation and high-cut by both input level and input noise in the ARC MKV enables suppression of multipath noise when the input level is high. And when the input level is less than 35dB, the noise detector signal is stopped (for ARC by input level only).

8. ADJUSTMENT

8.1 CHECK POINTS OF CASSETTE MECHANISM

Confirm the following items when replacing parts of the cassette mechanism.	■ Clearance between flywheel and flywheel bracket: 0.1 ~ 0.2 mm	■ Wow and flutter: Less than 0.25% (RMS) Less than 0.12% (WRMS) Using an STD-301A, measure the wow and flutter at the start and end of winding and take the maximum value. If values indicated by the pointer vary considerably, adjust to 70% of the minimum and maximum values. Measuring time shall be 5 ~ 6 seconds.
■ Fast forward and rewinding time: 120 ± 20 seconds Using an C-60, set to fast forward and rewind, and measure the time with a stop watch.	■ Winding torque: 35 ~ 44g·cm  Using a cassette type torque meter (120 g.cm), measure the minimum value while in the play mode. Measuring time shall be 5 ~ 6 seconds.	■ F.F torque: More than 60g.cm  Using a cassette type torque meter (160 g.cm), measure the value when the tope stops in the F.F. mode.
■ REW torque: More than 60g.cm  Using a cassette type torque meter (160 g.cm), measure the value when the tape stops in the REW mode.	■ Back tension torque: 1 ~ 2.5g.cm  After setting in the REW mode wihtout loading a cassette tape for 5 minutes, measure the back tension torque in the play mode, using a cassette type torque meter.	■ Pinch roller pressure: 220 ~ 280g  Measure the pressure with a tension meter (1 kg) at the point where the rotor stops rotating at the center of the pinch roller.
■ Cassette loading force: Less than 1,000g		

8.2 AZIMUTH ADJUSTMENT

- **To Adjust**

1. Playback STD-341A (10kHz, –20dB) and adjust the azimuth to obtain maximum output for both forward and reverse directions.
2. If the difference between forward and reverse is great, adjust to the midpoint of both directions.
3. After adjustment, lock in position using tightening screw.

8.3 DOLBY NR LEVEL ADJUSTMENT

- **Connection Diagram**

Switch position
Dolby NR switch .... OFF

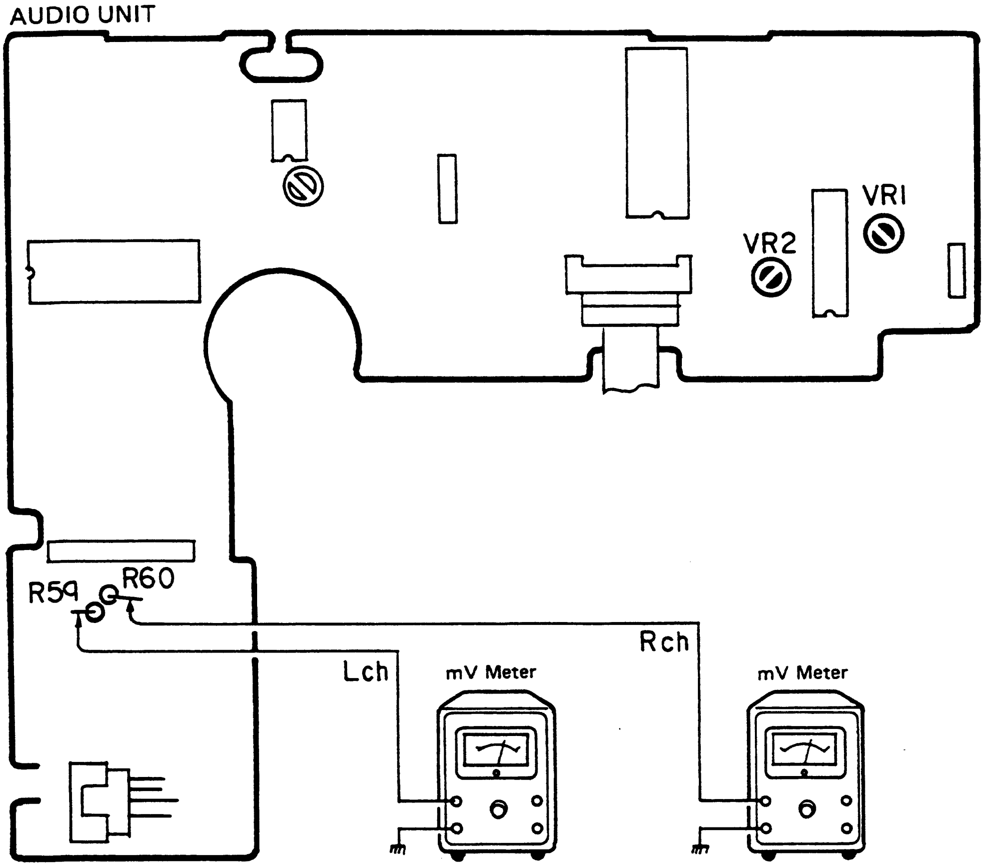


Fig. 46

- **To Adjust**

1. Playback the 400Hz, 200nwb/m portion of CT-150, and adjust VR1 (left channel) and VR2 (right channel) to obtain a millivoltmeter reading of 580mV (–2.5dBs). The adjusting accuracy is ± 1dBs.

8.4 TAPE SPEED ADJUSTMENT

- **Connection Diagram**

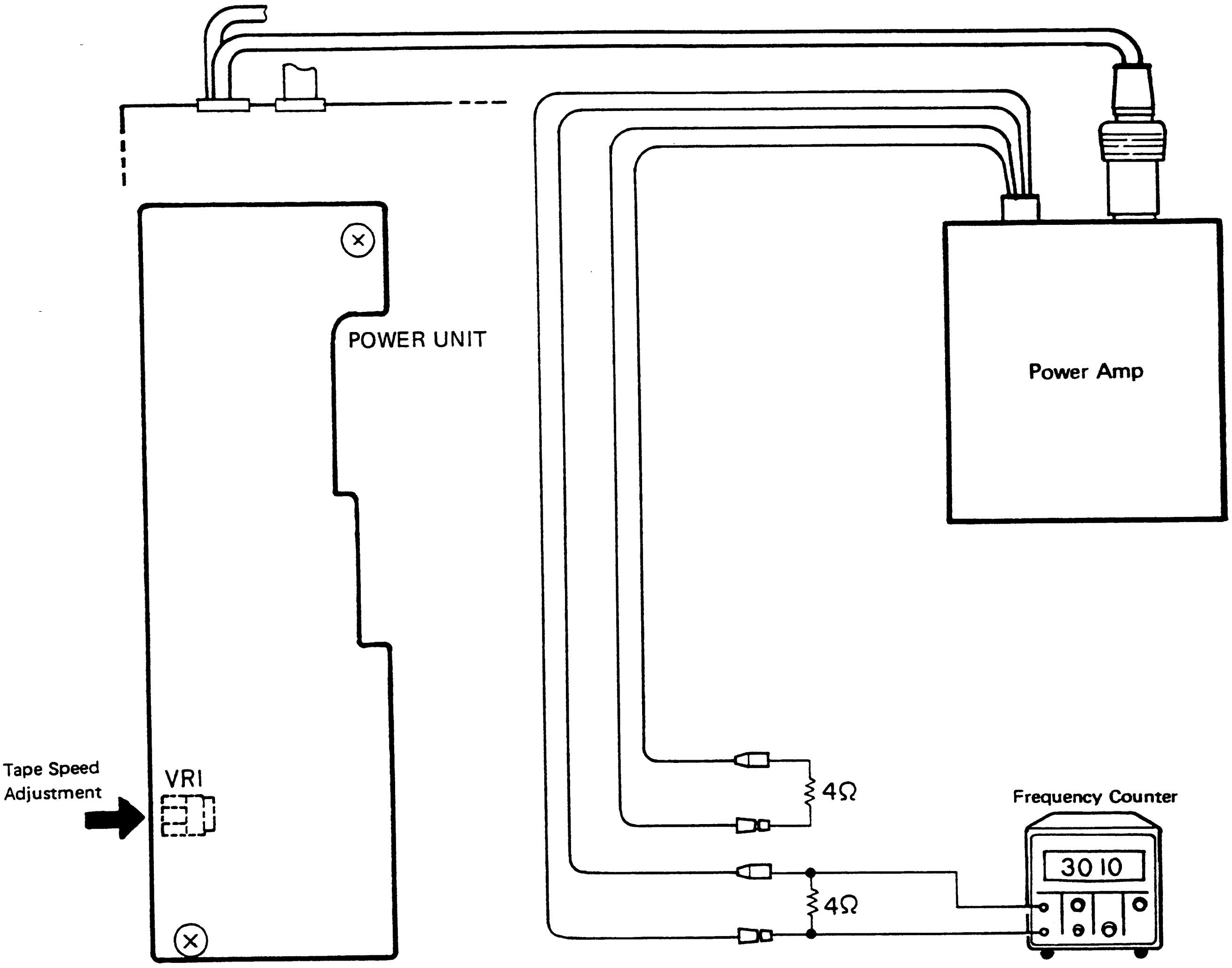

POWER UNIT
Power Amp
Tape Speed Adjustment
VR1
4Ω
4Ω
Frequency Counter
30 10

Fig. 47

- **To Adjust**

1. Playback STD-301 (3 kHz, −10dB) and adjust VR1 so that the frequency counter shown 3,010 Hz ± 30 Hz.

8.5 PLAY TORQUE ADJUSTMENT

• Connection Diagram

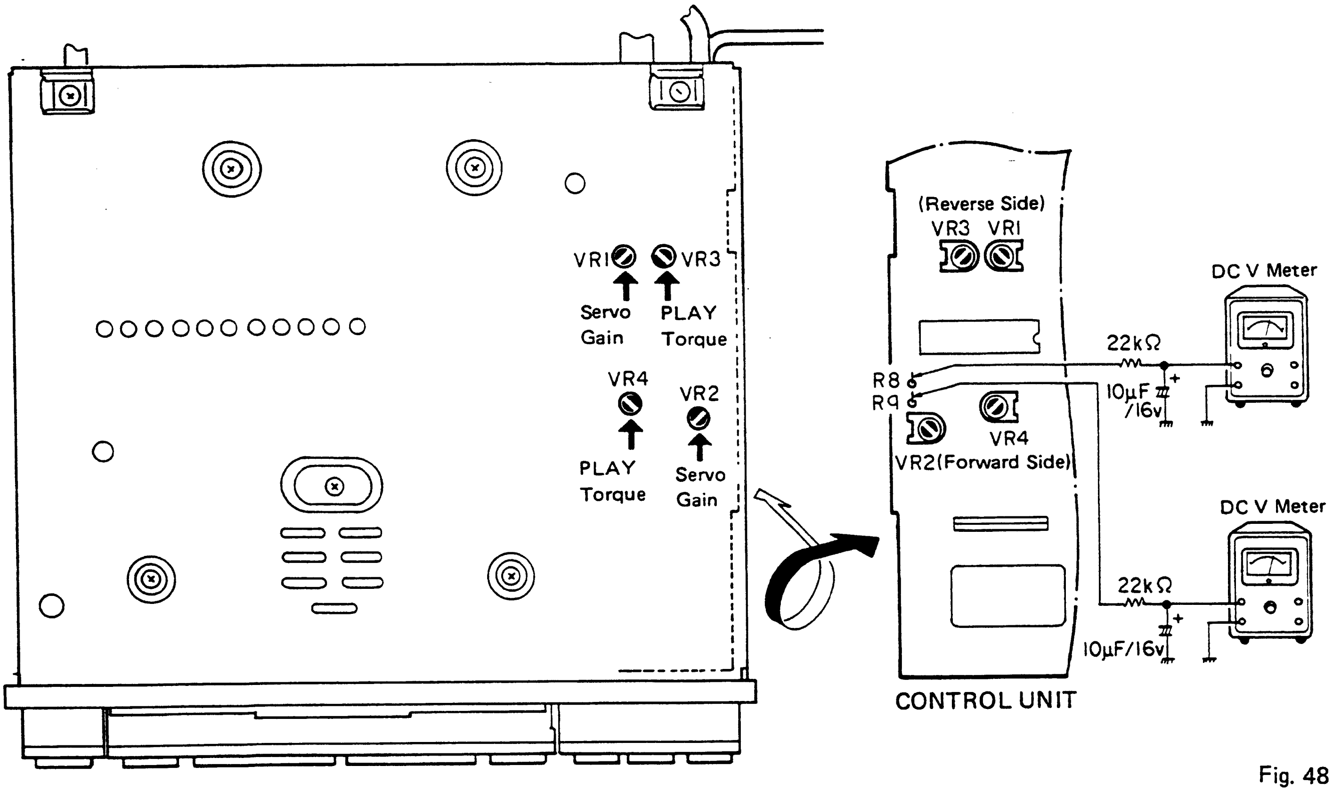

VR1
VR3
Servo Gain
PLAY Torque
VR4
VR2
PLAY Torque
Servo Gain
(Reverse Side)
VR3 VR1
R8
R9
VR4
VR2(Forward Side)
22kΩ
10µF/16v
DC V Meter
22kΩ
10µF/16v
DC V Meter
CONTROL UNIT

Fig. 48

• To Adjust

1. Playback a regular cassette tape (such as C-60), and adjust VR4 (forward) and VR3 (reverse) to obtain a reading of 4.0V ± 0.2V in the DC voltmeter.
2. Using a cassette type torque meter (120g-cm), check that the forward and reverse torque lies between 35 and 44g-cm.

8.6 SERVO GAIN ADJUSTMENT

• Connection Diagram

(Shown in Fig. 48)

• To Adjust

1. Connect a frequency counter to R59 of the audio unit.
2. Playback CT-910 at the MS speed in the forward direction, and adjust VR2 to obtain a frequency counter reading of 2,200Hz ± 300Hz.
3. Rewind the table back to tire beginning of the recorded signal section, and then take the tape out and reload it in reverse.
4. Play the tape in reverse at the MS speed and adjust VR1 to again obtain a reading of 2,200Hz ± 300Hz in the frequency counter.
5. With the tape in ATSC mode, check that DC voltmeter readings of 7V are obtained in both the forward and reverse directions.

8.7 ELECTRONIC VOLUME CONTROL ADJUSTMENT

- **Connection Diagram**

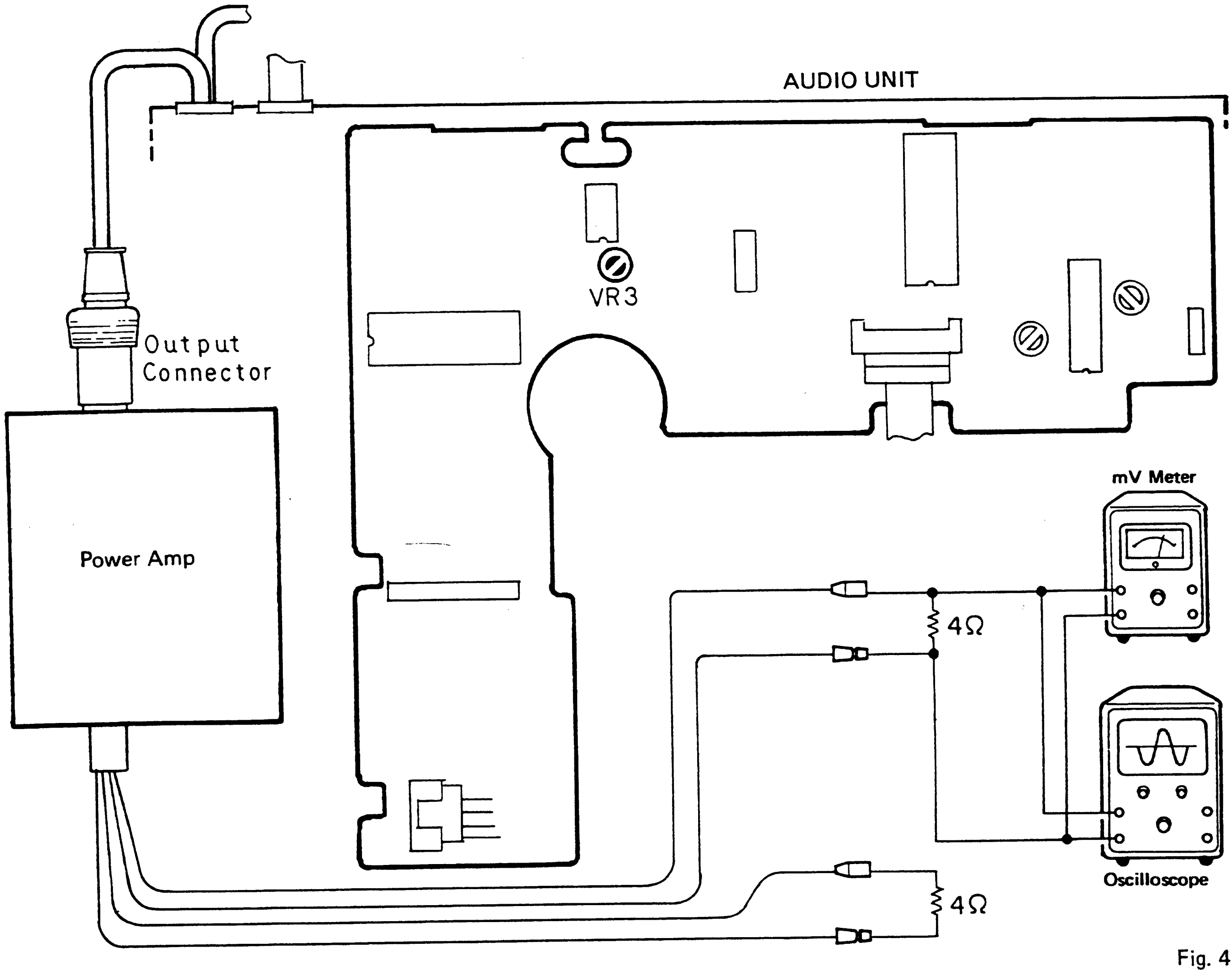

AUDIO UNIT
VR3
Output Connector
Power Amp
mV Meter
4Ω
4Ω
Oscilloscope

Fig. 49

- **To Adjust**

1. Turn VR3 fully around clockwise.
2. Playback STD-341A (333Hz, −20dB) and press the electronic UP volume control to adjust to maximum volume. Check that the output is not subjected to clipping at this time.
3. Then press the electronic DOWN volume control four times, and adjust VR3 so that the output level at this time is 1.5dB ± 1dB below the maximum volume level.
4. Check that a maximum output volume level of at least +5dBs is attained.

8.8 FM IF ADJUSTMENT

• Connection Diagram

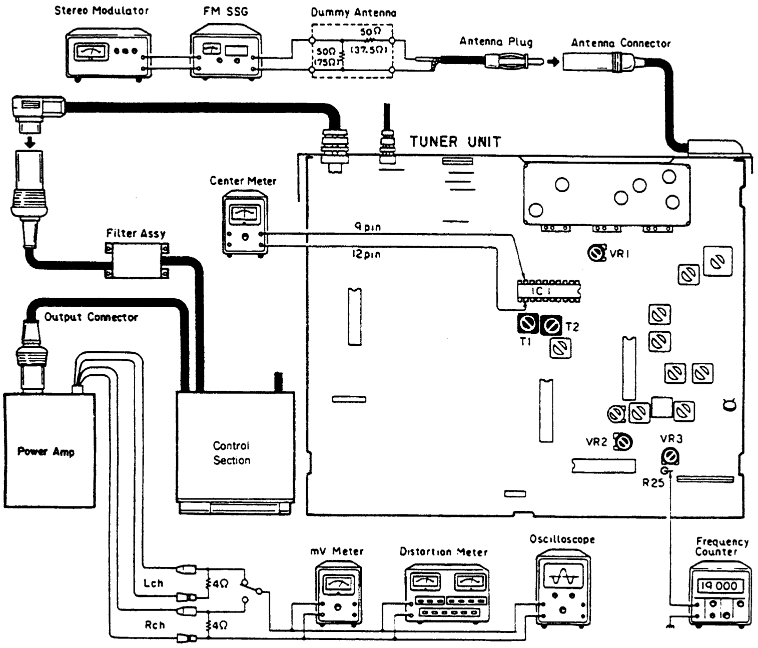

Stereo Modulator
FM SSG
Dummy Antenna
50Ω
50Ω
(75Ω)
(37.5Ω)
Antenna Plug
Antenna Connector
TUNER UNIT
Center Meter
9 pin
12 pin
Filter Assy
IC 1
VR1
T1
T2
VR2
VR3
R25
Output Connector
Power Amp
Control Section
Lch
Rch
4Ω
4Ω
mV Meter
Distortion Meter
Oscilloscope
Frequency Counter
19 000

Fig. 50

• To Adjust

1. Apply a 98MHz, 400Hz 100% modulated 60dB (μV) signal from the FM SSG, and tune the tuner to 98MHz.
2. Adjust T1 to obtain a 0 reading in the center meter.
3. Adjust T2 to the point of minimum distortion.

8.9 FM MPX ADJUSTMENT

• Connection Diagram

(Shown in Fig. 50)

• To Adjust

1. Apply a 98MHz 60dB (μV) unmodulated signal from the FM SSG, and adjust VR3 to obtain frequency counter reading of 19kHz ± 120Hz.
2. Apply the stereo signal (1kHz, 100% modulated), and adjust VR2 to the point of maximum separation.
3. Apply an input signal of 35dB (μV), and adjust VR1 to a separation of 5dB.

8.10 FM TRACKING ADJUSTMENT

• Connection Diagram

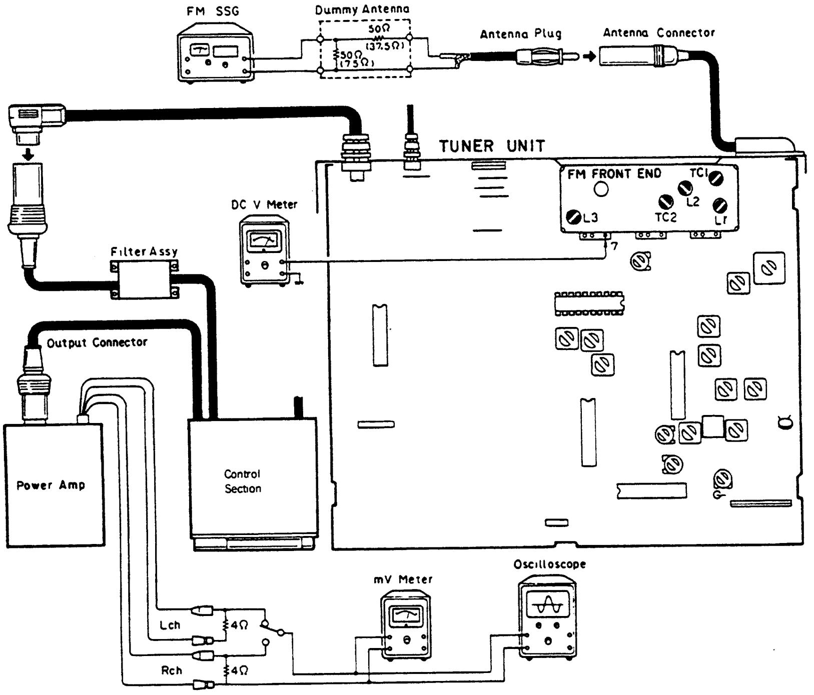

FM SSG
Dummy Antenna
50Ω
(37.5Ω)
50Ω
(75Ω)
Antenna Plug
Antenna Connector
TUNER UNIT
FM FRONT END
TC1
L2
L3
TC2
L1
7
DC V Meter
Filter Assy
Output Connector
Power Amp
Control Section
mV Meter
Oscilloscope
Lch
4Ω
Rch
4Ω

Fig. 51

• To Adjust

Frequency of FM SSG	Displayed Frequency	Adjusting Point	DC V Meter	mV Meter
1.	107.9 MHz	L3	7.6 ± 0.3V	
2.	88.1 MHz	For confirmation Only	2.2 ± 0.5V	
3. 90 MHz (400 Hz, 100% modulation) output level 10 dB (μV)	90 MHz	L1, L2		Maximum output
4. 106 MHz (400 Hz, 100% modulation) output level 10 dB (μV)	106 MHz	TC1, TC2		Maximum output
5. Repeat items (3) and (4) alternately so that the mV meter indicates maximum output.				

8.11 AM IF ADJUSTMENT

• Connection Diagram

IF Generator Scope
Sweep center frequency . . . . 450 kHz
Input gain . . . . 0.3 V p-p/cm

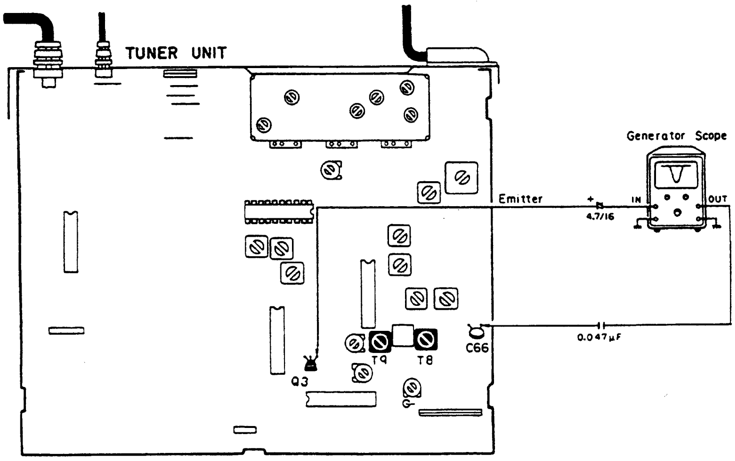

TUNER UNIT
Generator Scope
Emitter
+
4.7/16
IN
OUT
0.047μF
C66
T9
T8
Q3

Fig. 52

• To Adjust

1. Set the input the generator scope to the range within which the U curve can be verified and move the coil of T8 and T9 until the U curve is adjusted to its maximum amplitude and optimum symmetry.

8.12 AM TRACKING ADJUSTMENT

• Connection Diagram

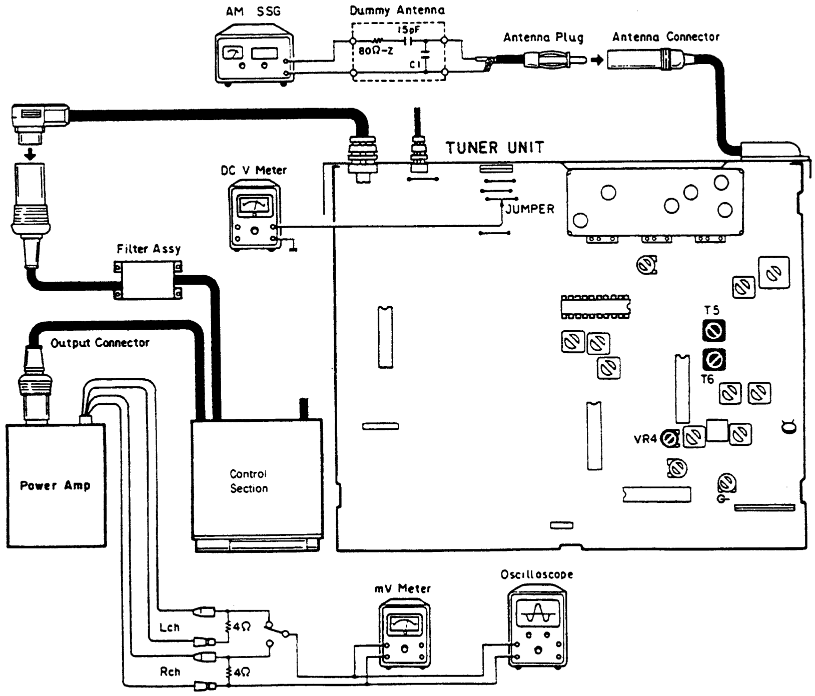

AM SSG
Dummy Antenna
15pF
80Ω-Z
C1
Antenna Plug
Antenna Connector
TUNER UNIT
DC V Meter
JUMPER
Filter Assy
Output Connector
T5
T6
VR4
Power Amp
Control Section
Lch
Rch
4Ω
4Ω
mV Meter
Oscilloscope

Fig. 53

NOTICE:
Select C1 so that the total capacity of 80pF is attained from the direction of the receiver jack.
Z: Output impedance of the SSG.

• To Adjust

Frequency of AM SSG	Displayed Frequency	Adjusting Point	DC V Meter	mV Meter
1.	531 kHz	For Confirmation Only	More than 0.8V	
2. 603 kHz (400 Hz, 30% modulation) output level 25 dB (μV)	603 kHz	T5, T6		Maximum output
3.	1,602 kHz	For Confirmation Only	More than 8.5V	

8.13 AM SEEK STOP SENSITIVITY ADJUSTMENT

• Connection Diagram

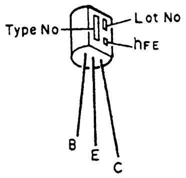
(Shown in Fig. 53)

• To Adjust

1. Set output level of AM SSG at 24dB (μV).
2. Carry out "SEEK" at DX state and adjust VR4 until "SEEK" stops.

- **ICs and Transistors**

2SC2570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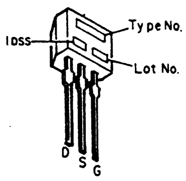
Lot No
hFE
B
E
C

2SK241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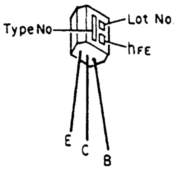
Type No.
Lot No.
D
S
G

2SD1012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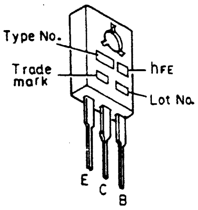
C
B

2SB772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Trade mark
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Lot No.
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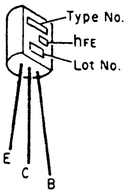
B

2SB562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Lot No.
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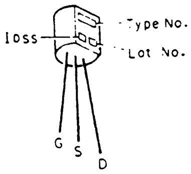
C
B

P003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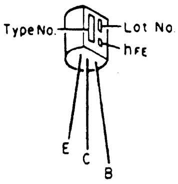
Type No.
Lot No.
G
S
D

2SC1675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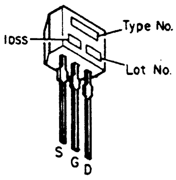
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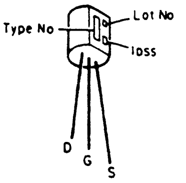
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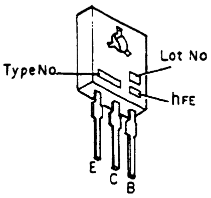
S

2SA900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C
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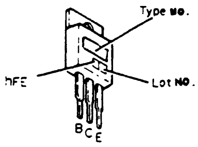
2SD1062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Lot No.
B
C
E

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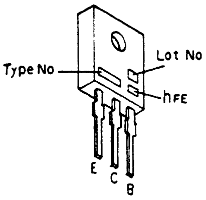
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Lot No
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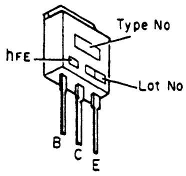
C
B

2SB952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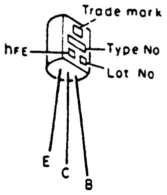
Lot No
B
C
E

2SC2634NC


Trade mark
hFE
Type No
Lot No
E
C
B

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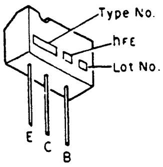
2SC2021F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Lot No.
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C
B

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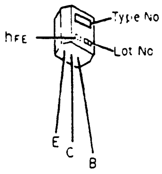
2SC3113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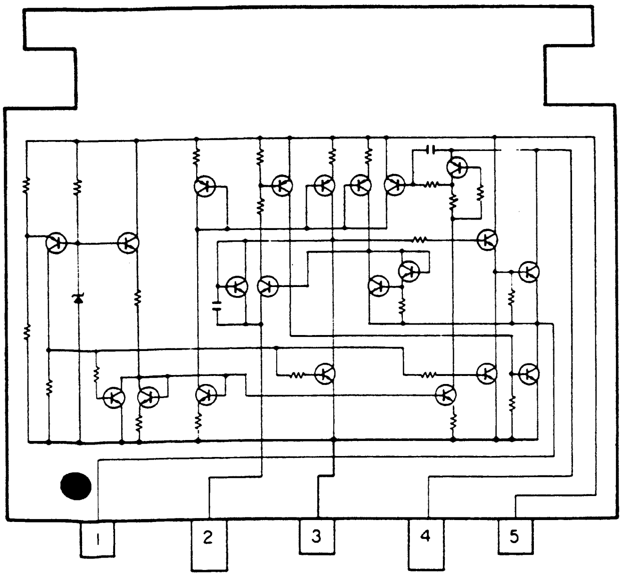
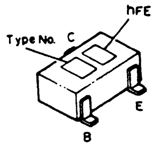
E
C
B

PA3009

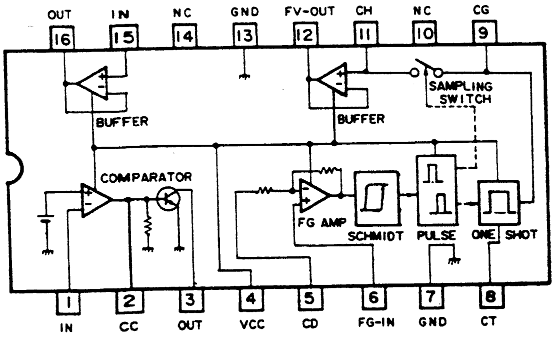


CHIP TRANSISTORS

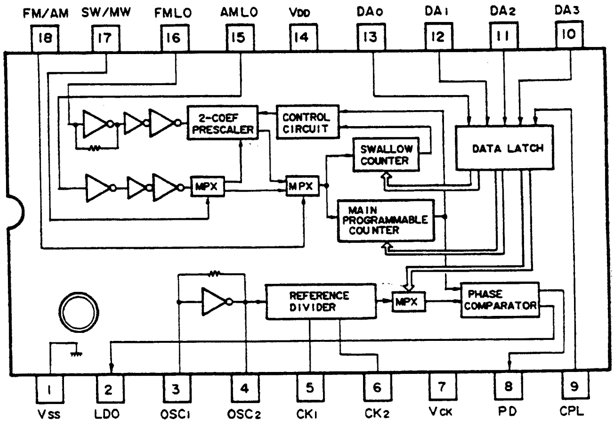
Part No.	Indication (Type No., hFE)
2SA1179-M5	M5
2SA1179-M6	M6
2SA1179-M7	M7
2SB709-AQ	AQ
2SB709-AR	AR
2SB709-AS	AS 
2SC2712-LG	LG
2SC2712-LL	LL
2SC2712-LY	LY
2SD601-YQ	YQ
2SD601-YR	YR
2SD601-YS	YS
2SB779-R	1AR
2SB779-S	1AS

hFE
Type No.
C
E
B

PA0002A


OUT
IN
NC
GND
FV-OUT
CH
NC
CG
16
15
14
13
12
11
10
9
BUFFER
BUFFER
SAMPLING SWITCH
COMPARATOR
FG AMP
SCHMIDT
PULSE
ONE SHOT
1
2
3
4
5
6
7
8
IN
CC
OUT
VCC
CD
FG-IN
GND
CT

MN6147


FM/AM
SW/MW
FMLO
AMLO
VDD
DA0
DA1
DA2
DA3
18
17
16
15
14
13
12
11
10
2-COEF PRESCALER
CONTROL CIRCUIT
SWALLOW COUNTER
DATA LATCH
MPX
MPX
MAIN PROGRAMMABLE COUNTER
REFERENCE DIVIDER
MPX
PHASE COMPARATOR
1
2
3
4
5
6
7
8
9
Vss
LDO
OSC1
OSC2
CK1
CK2
VCK
PD
CPL

Pin Functions (MN6147)

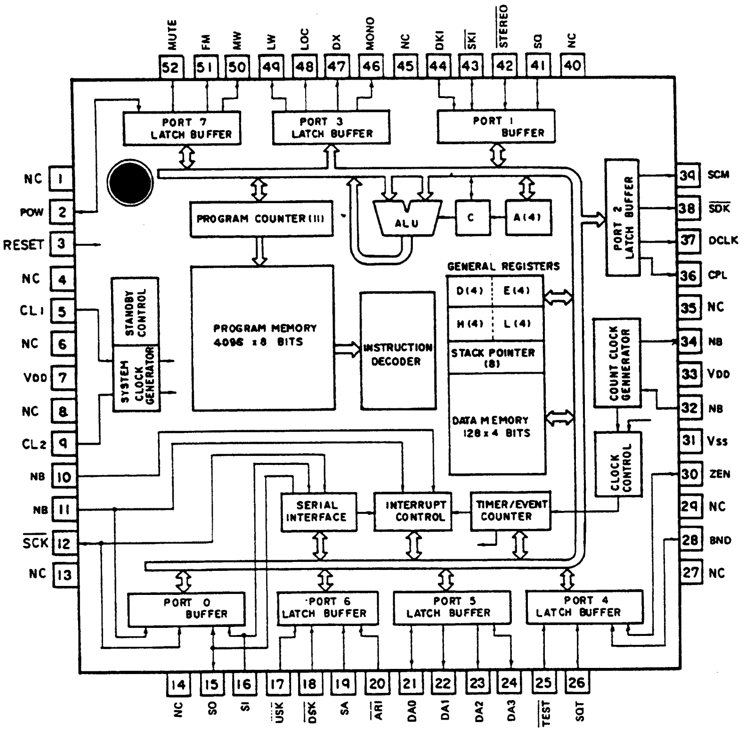
Pin No.	Pin Name	I/O	Function and Operation
1	Vss		GND
2	LDO (QO)	Output	Lock detector output (oscillator circuit output)
3	OSC1		4.5 MHz crystal oscillation
4	OSC2		
5	CK1	Output	Clock output 1
6	CK2	Output	Clock output 2 (250 Hz)
7	VCK		Battery back-up for frequency divider circuit (5V).
8	PD	Output	Phase detector output (3-state)
9	CPL		Latch clock
10	DA3	Input	Data and address input (MSB)
11	DA2	Input	Data and address input
12	DA1	Input	
13	DA0	Input	Data and address input (LSB)
14	VDD		Power supply 5V.
15	AMLO	Input	AM local oscillating signal input
16	FMLO	Input	FM local oscillating signal input
17	SW/MW		SW/MW changeover
18	FM/AM		FM/AM changeover

Pin Function (PD4046B)

Pin No.	Pin Name	I/O	Function and Operation
1	NC		
2	POW	Output	Power supply control output. Active "H".
3	RESET	Input	Hardware reset input. Active "H".
4	NC		
5	CL1	Input	System clock oscillator circuit. CR pin.
6	NC		
7	VDD		Power supply pin. +5V.
8	NC		
9	CL2	Output	System clock oscillator circuit. CR pin.
10	NB	Input	Set to GND level.
11	NB	Input	Set to GND level.
12	$\overline{\text{SCK}}$		Shift clock I/O pin for serial interface.
13	NC		
14	NC		
15	SO	Output	Serial inteface data output pin.
16	SI	Input	Serial inteface data input pin.
17	$\overline{\text{USK}}$	Input	Up-seek switch input. Active "L".
18	$\overline{\text{DSK}}$	Input	Down-seek switch input. Active "L".
19	SA	Input	FM IF offset changeover. "L" level.
20	$\overline{\text{ARI}}$	Input	Input pin for SDK function. "H" level . . . . . SDK function ineffective. "L" level . . . . . SDK function effective.
21	DA0	Output	LSB
22	DA1	Output	PLL IC (MN6147) control data output pin.
23	DA2	Output	
24	DA3	Output	MSB
25	$\overline{\text{TEST}}$	Input	Input pin for test program execution. Provides test program mode at "L" level with power on reset.
26	SQT	Input	Scan stop signal sensing time change over input pin.
27	NC		
28	BND	Input	2-BAND/3-BAND changeover input pin. "H" level . . . . . 3-BAND "L" level 2-BAND
29	NC		
30	ZEN	Input	Input pin used to cancel "0" button" function by means of "preset memory call" provided by remote-control unit. Cancelled at "L" level.
31	VSS		Power supply pin. GND
32	NB	Input	VDD or VSS level.
33	VDD		Power supply pin. +5V
34	NB	Output	Open
35	NC		
36	CPL	Output	PLL IC (MN6147) control data latch pulse output pin.
37	DCLK	Output	100Hz duty 50% pulse output with tuner ON.
38	$\overline{\text{SDK}}$	Output	SDK ON/OFF output. Provides "H" level output normally; provides "L" level with SDK ON.
39	SCM	Output	SDK scan mute output. Provides "H" level output while PLL control data is set.
40	NC		
41	SQ	Input	Scan stop signal input. Active "H".

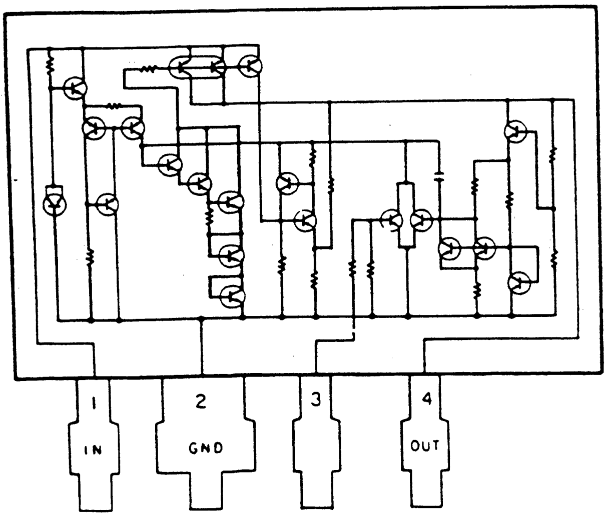
Pin No.	Pin Name	I/O	Function and Operation
42	$\overline{\text{STEREO}}$	Input	FM stereo indicator input. Stereo indicator lights up at "L" level during FM reception (at AUTO mode).
43	$\overline{\text{SKI}}$	Input	SDK/SK signal input terminal.
44	DKI	Input	SDK/DK signal input terminal.
45	NC		
46	MONO	Output	FM AUTO/MONO changeover output. MONO at "H" level.
47	DX	Output	Scan stop sensitivity changeover output. Provides "H" level output while scanning with LOC.S OFF
48	LOC	Output	Scan stop sensitivity changeover output. Provides "H" level output while scanning with LOC.S ON.
49	LW	Output	Band changeover control output. Provides "H" level during LW reception.
50	MW	Output	Band changeover control output. Provides "H" level during MW reception.
51	FM	Output	Band changeover control output. Provides "H" level during FM reception.
52	MUTE	Output	Mute signal output. Active "H".

***PD4046B**

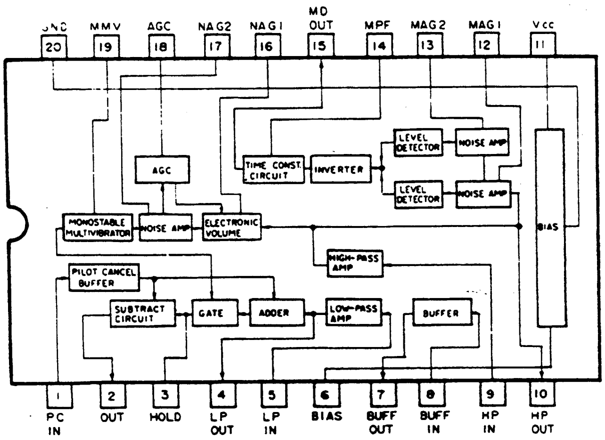

MUTE
FM
MW
LW
LOC
DX
MONO
NC
DKI
SKI
STEREO
SQ
NC
52
51
50
49
48
47
46
45
44
43
42
41
40
PORT 7 LATCH BUFFER
PORT 3 LATCH BUFFER
PORT 1 BUFFER
NC 1
POW 2
RESET 3
NC 4
CL1 5
NC 6
VDD 7
NC 8
CL2 9
NB 10
NB 11
SCK 12
NC 13
PROGRAM COUNTER (11)
ALU
C
A(4)
PORT 2 LATCH BUFFER
39 SCM
38 SDK
37 DCLK
36 CPL
35 NC
34 NB
33 VDD
32 NB
31 Vss
30 ZEN
29 NC
28 BND
27 NC
STANDBY CONTROL
SYSTEM CLOCK GENERATOR
PROGRAM MEMORY 4096 x 8 BITS
INSTRUCTION DECODER
GENERAL REGISTERS
D(4)
E(4)
H(4)
L(4)
STACK POINTER (8)
DATA MEMORY 128 x 4 BITS
COUNT CLOCK GENNERATOR
CLOCK CONTROL
SERIAL INTERFACE
INTERRUPT CONTROL
TIMER/EVENT COUNTER
PORT 0 BUFFER
PORT 6 LATCH BUFFER
PORT 5 LATCH BUFFER
PORT 4 LATCH BUFFER
14
15
16
17
18
19
20
21
22
23
24
25
26
NC
SO
SI
USK
DSK
SA
ARI
DA0
DA1
DA2
DA3
TEST
SQT

*IC's marked by *are MOS type.*
Be careful in handling them because they are very liable to be damaged by electrostatic induction.

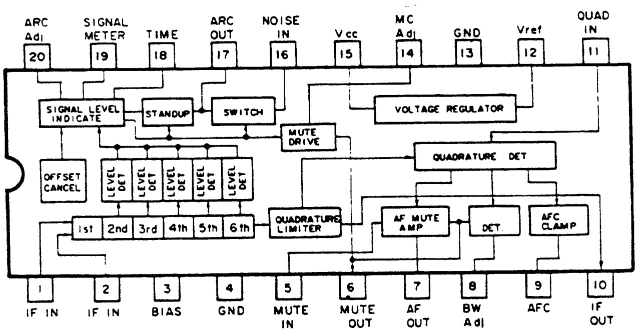
AN6540


1
IN
2
GND
3
4
OUT

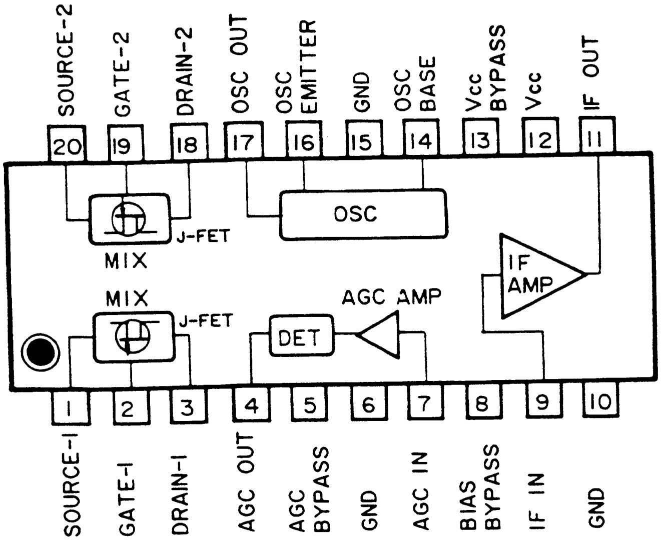
PA0014


GND 20
MMV 19
AGC 18
NAG2 17
NAG1 16
MD OUT 15
MPF 14
MAG2 13
MAG1 12
Vcc 11
LEVEL DETECTOR
NOISE AMP
AGC
TIME CONST. CIRCUIT
INVERTER
LEVEL DETECTOR
NOISE AMP
MONOSTABLE MULTIVIBRATOR
NOISE AMP
ELECTRONIC VOLUME
BIAS
HIGH-PASS AMP
PILOT CANCEL BUFFER
SUBTRACT CIRCUIT
GATE
ADDER
LOW-PASS AMP
BUFFER
1 PC IN
2 OUT
3 HOLD
4 LP OUT
5 LP IN
6 BIAS
7 BUFF OUT
8 BUFF IN
9 HP IN
10 HP OUT

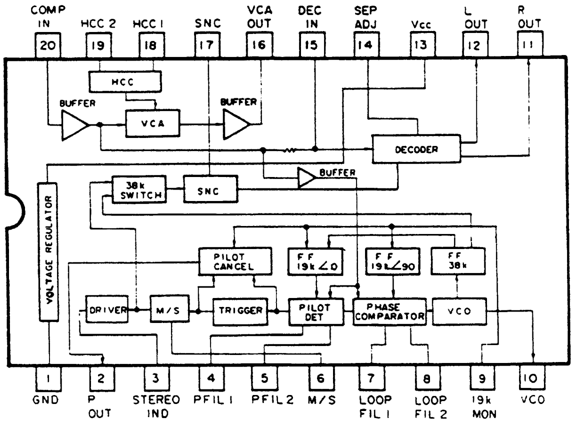
PA0013


ARC Adj 20
SIGNAL METER 19
TIME 18
ARC OUT 17
NOISE IN 16
Vcc 15
MC Adj 14
GND 13
Vref 12
QUAD IN 11
SIGNAL LEVEL INDICATE
STANDUP
SWITCH
VOLTAGE REGULATOR
MUTE DRIVE
QUADRATURE DET
OFFSET CANCEL
LEVEL DET
1st
2nd
3rd
4th
5th
6th
QUADRATURE LIMITER
AF MUTE AMP
DET
AFC CLAMP
1 IF IN
2 IF IN
3 BIAS
4 GND
5 MUTE IN
6 MUTE OUT
7 AF OUT
8 BW Adj
9 AFC
10 IF OUT

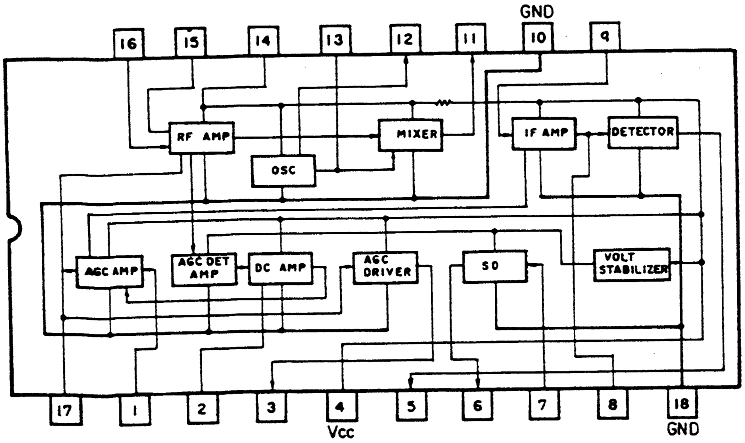
PA4009


SOURCE-2 20
GATE-2 19
DRAIN-2 18
OSC OUT 17
OSC EMITTER 16
GND 15
OSC BASE 14
Vcc BYPASS 13
Vcc 12
IF OUT 11
J-FET
MIX
OSC
IF AMP
MIX
J-FET
AGC AMP
DET
1 SOURCE-1
2 GATE-1
3 DRAIN-1
4 AGC OUT
5 AGC BYPASS
6 GND
7 AGC IN
8 BIAS BYPASS
9 IF IN
10 GND

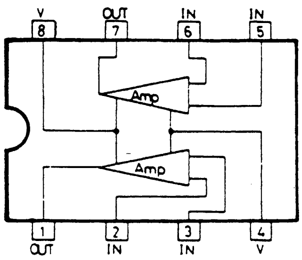
PA0015


COMP IN 20
HCC 2 19
HCC 1 18
SNC 17
VCA OUT 16
DEC IN 15
SEP ADJ 14
Vcc 13
L OUT 12
R OUT 11
HCC
BUFFER
VCA
BUFFER
DECODER
BUFFER
VOLTAGE REGULATOR
38k SWITCH
SNC
PILOT CANCEL
FF 19k∠0
FF 19k∠90
FF 38k
DRIVER
M/S
TRIGGER
PILOT DET
PHASE COMPARATOR
VCO
1 GND
2 P OUT
3 STEREO IND
4 PFIL 1
5 PFIL 2
6 M/S
7 LOOP FIL 1
8 LOOP FIL 2
9 19k MON
10 VCO

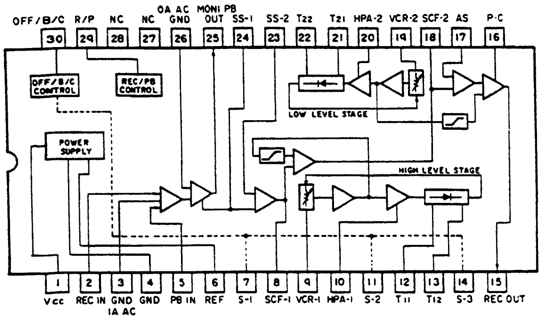
HA12434


16
15
14
13
12
11
GND 10
9
RF AMP
MIXER
IF AMP
DETECTOR
OSC
AGC AMP
AGC DET AMP
DC AMP
AGC DRIVER
SD
VOLT STABILIZER
17
1
2
3
4 Vcc
5
6
7
8
18 GND

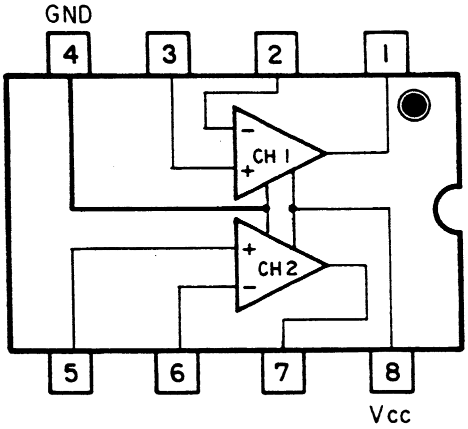
TA75558P


V 8
OUT 7
IN 6
IN 5
Amp
Amp
1 OUT
2 IN
3 IN
4 V

PA3017


OFF/B/C
R/P
NC
NC
OA AC GND
MONI PB OUT
SS-1
SS-2
T22
T21
HPA-2
VCR-2
SCF-2
AS
P·C
30
29
28
27
26
25
24
23
22
21
20
19
18
17
16
OFF/B/C CONTROL
REC/PB CONTROL
LOW LEVEL STAGE
POWER SUPPLY
HIGH LEVEL STAGE
1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
Vcc
REC IN
GND IA AC
GND
PB IN
REF
S-1
SCF-1
VCR-1
HPA-1
S-2
T11
T12
S-3
REC OUT

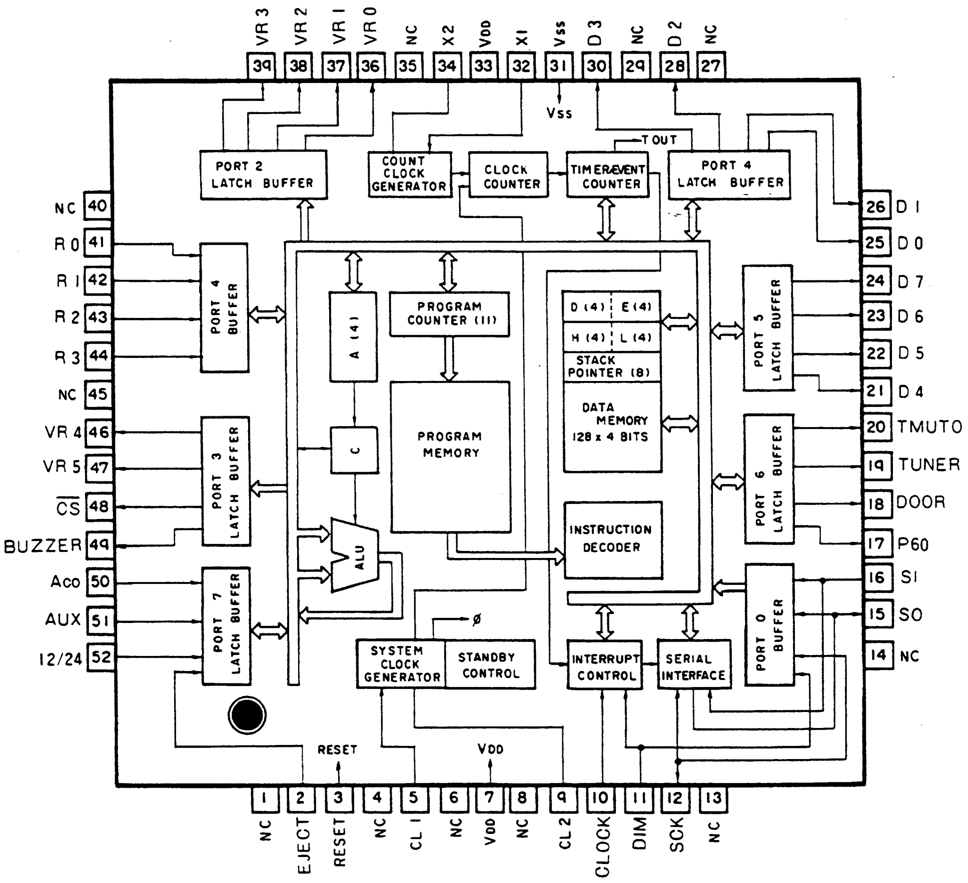
HA17358


GND
4
3
2
1
CH 1
CH 2
5
6
7
8
Vcc

Pin Functions (PA3017)

Pin No.	Pin Name	I/O	Function and Operation
1	Vcc		+B
2	REC IN	Input	Recording signal input
3	IA AC GND		Input amplifier inverted input
4	GND		
5	PB IN	Input	Playback signal input
6	REF		Reference pin
7	S-1		High level stage, side-chain filter selector switch
8	SCF-1		High level stage, side-chain filter pin
9	VCR-1		High level stage, VCR pin
10	HPA-1		High level stage, high-pass amplifier output
11	S-2		Time constant selector switch
12	T11		Time constant pins
13	T12		
14	S-3		Time constant selector switch
15	REC OUT	Output	Encoder output
16	P.C		Phase compensation capacitor
17	AS		Antisaturation network
18	SCF-2		Low level stage, side-chain filter pin
19	VCR-2		Low level stage, VCR pin
20	HPA-2	Output	Low level stage, high-pass amplifier output
21	T21		Low level stage, time constant pins
22	T22		
23	SS-2		Spectrum skewing pins
24	SS-1		
25	MON P.B OUT	Output	Monitor & decoder output
26	OA AC GND	Input	Output amplifier inverted input
27	NC		
28	NC		
29	R/$\overline{P}$		Recording/playback mode control. "H" for REC.
30	OFF/BIG		Dolby NR mode control

***PD4050B**


VR 3
VR 2
VR 1
VR 0
NC
X2
VDD
X1
Vss
D3
NC
D2
NC
39
38
37
36
35
34
33
32
31
30
29
28
27
Vss
T OUT
PORT 2 LATCH BUFFER
COUNT CLOCK GENERATOR
CLOCK COUNTER
TIMER/EVENT COUNTER
PORT 4 LATCH BUFFER
NC 40
R 0 41
R 1 42
R 2 43
R 3 44
NC 45
VR 4 46
VR 5 47
CS 48
BUZZER 49
Aco 50
AUX 51
12/24 52
PORT 4 BUFFER
PORT 3 LATCH BUFFER
PORT 7 LATCH BUFFER
A (4)
C
ALU
PROGRAM COUNTER (11)
PROGRAM MEMORY
D (4) E (4)
H (4) L (4)
STACK POINTER (8)
DATA MEMORY 128 x 4 BITS
INSTRUCTION DECODER
PORT 5 LATCH BUFFER
PORT 6 LATCH BUFFER
PORT 0 BUFFER
26 D 1
25 D 0
24 D 7
23 D 6
22 D 5
21 D 4
20 TMUTO
19 TUNER
18 DOOR
17 P60
16 SI
15 SO
14 NC
ø
SYSTEM CLOCK GENERATOR
STANDBY CONTROL
INTERRUPT CONTROL
SERIAL INTERFACE
RESET
VDD
1
2
3
4
5
6
7
8
9
10
11
12
13
NC
EJECT
RESET
NC
CL 1
NC
VDD
NC
CL 2
CLOCK
DIM
SCK
NC

Pin Functions

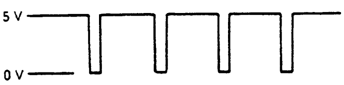
Pin No.	Pin Name	I/O	Function and Operation
1	NC		
2	EJECT	Input	EJECT input from reel motor control IC. Active "H".
3	RESET	Input	CPU hardware reset input. Active "H".
4	NC		
5	CL 1		System clock generator circuit CR connection pins. (200kHz)
6	NC		
7	VDD		Power supply pin
8	NC		
9	CL2		System closck generator circuit CR connection pins. (200kHz)
10	CLOCK	Input	100Hz input from PD4022B.
11	DIM	Input	Small lamp input.
12	SCK	Input Output	Serial interface serial clock input/output pin.
13、14	NC		
15	SO	Output	Serial interface data output pin
16	SI	Input	Serial interface data input pin
17	P60	Output	Universal output port (not used)
18	DOOR	Output	Door opening output port. Active "H".

Pin No.	Pin Name	I/O	Function and Operation
19	TUNER	Output	"H" level when tuner is ON.
20	TMUTO	Output	"H" output pin when tuner is switched on and off independently.
21	D 4	Output	Key input strobe output pins. Active "H". (D6 is not used)
22	D 5	Output	
23	D 6	Output	
24	D 7	Output	
25	D 0	Output	
26	D 1	Output	
27	NC		
28	D 2	Output	Key input strobe output pin. Active "H".
29	NC		
30	D 3	Output	Key input strobe output pin. Active "H".
31	Vss		GND
32	X 1	Input	Counter clock input pin (32.768kHz)
33	VDD		Power supply pin.
34	X 2		X'tal connection pin.
35	NC		
36~39	VR 0 ~VR 3	Output	Volume data output pins. Active "H".
40	NC		
41~44	R 0 ~R 3	Input	Key input return input pins.
45	NC		
46、47	VR 4 、VR 5	Output	Volume data output pins. Active "H".
48	$\overline{CS}$	Output	PD7005 chip selector signal output pin. Active "L".
49	BUZZER	Output	Buzzer drive clock output pin. 3.8kHz
50	ACC	Input	Accessory key ON/OFF input pin. "H" when ON.
51	AUX	Input	AUX ON/OFF input pin. ON when "H".
52	$\overline{12}$/24	Input	12/24 hour display switching input pin. 12-hour when "L".

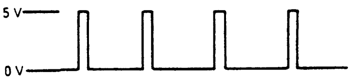
*Check the following items to determine whether PD4050B is operating or not.

1. Approximately 5V should be applied to pins 7 and 33.
2. Pin 3 should be at "L", but not connected to GND. 5V should be applied to pin 3 when the CLEAR button is pressed.
3. Approximately 5V should be applied to pin 50.
4. An oscillator output of about 200kHz should be applied to pin 9.
5. The following output waveforms should be observed at the respective pins (data transmission).

Pin 12、16

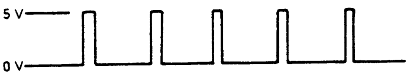


Pin 15

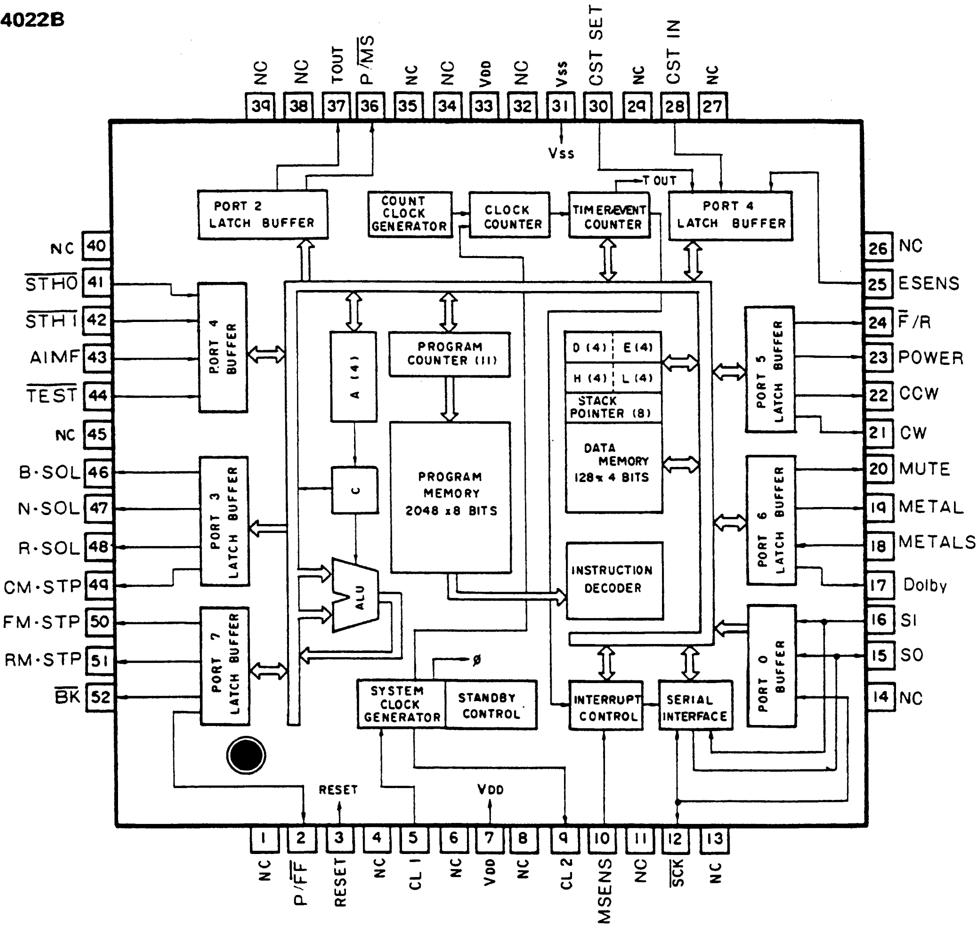


(Matrix Circuit)

Pin 21、22、24~26、28、30

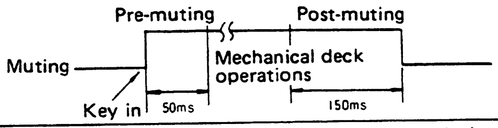


***PD4022A or PD4022B**


NC 39
NC 38
TOUT 37
P/MS 36
NC 35
NC 34
VDD 33
NC 32
Vss 31
CST SET 30
NC 29
CST IN 28
NC 27
Vss
T OUT
PORT 2 LATCH BUFFER
COUNT CLOCK GENERATOR
CLOCK COUNTER
TIMER/EVENT COUNTER
PORT 4 LATCH BUFFER
NC 40
STH0 41
STH1 42
AIMF 43
TEST 44
NC 45
B·SOL 46
N·SOL 47
R·SOL 48
CM·STP 49
FM·STP 50
RM·STP 51
BK 52
PORT 4 BUFFER
PORT 3 LATCH BUFFER
PORT 7 LATCH BUFFER
A (4)
C
ALU
PROGRAM COUNTER (11)
PROGRAM MEMORY 2048 x8 BITS
D (4) E (4)
H (4) L (4)
STACK POINTER (8)
DATA MEMORY 128x 4 BITS
INSTRUCTION DECODER
ø
SYSTEM CLOCK GENERATOR
STANDBY CONTROL
INTERRUPT CONTROL
SERIAL INTERFACE
PORT 5 LATCH BUFFER
PORT 6 LATCH BUFFER
PORT 0 BUFFER
26 NC
25 ESENS
24 F/R
23 POWER
22 CCW
21 CW
20 MUTE
19 METAL
18 METALS
17 Dolby
16 SI
15 SO
14 NC
RESET
VDD
1 NC
2 P/FF
3 RESET
4 NC
5 CL1
6 NC
7 VDD
8 NC
9 CL2
10 MSENS
11 NC
12 SCK
13 NC

Pin Functions

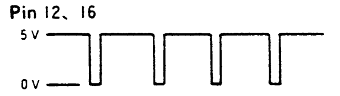
Pin No.	Pin Name	I/O	Function and Operation
1	NC		
2	P/FF	Output	Reel motor servo IC PA0008 servo switching output. "H" level during PLAY mode, "L" level during FF, REW, and MS modes.
3	RESET	Input	Reset input. Program is started from address 0 when "H" level is applied temporarily to this pin.
4	NC		
5	CL1	Input	Reference clock generator input.
6	NC		
7	VDD		Power supply.
8	NC		
9	CL2	Output	Reference clock generator input.
10	MSENS	Input	MS operation audio signal input pin. Music and blank sections of tape judged according to deck operating status.
11	NC		Normally GND.
12	SCK	Input Output	Synchronizing clock pin for serial data transfer. This pin is used by alternate input/output switching for transmitting and receiving purposes. Receiving: To accept external sync clock, this pin is switched to input mode, and SI pin data is read by the rising edge of this pin. Transmitting: Switched to output mode where output data is passed to the SO pin by the falling edge of this pin.
13、14	NC		

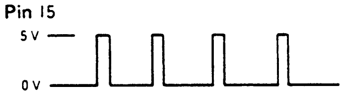
Pin No.	Pin Name	I/O	Function and Operation
15	SO	Output	Data output pin for serial data transfer.
16	SI	Input	Data input pin for serial data transfer.
17	Dolby	Output	Dolby NR circuit control output pin. OFF: "L" level B: "H" level C: High impedance
18	METALS	Input	Auto chrome detector switch input pin. "H" level output obtained from METAL pin when "H" level is applied to this pin. (Only operates during ATSC mode).
19	METAL	Output	Equalizer circuit time constant switching output pin. The output differs according to the METALS pin input. (Only operates during ATSC mode, the output normally being held).
20	MUTE	Output	Audio muting output for prevention of noise during mechanical deck operations. Output is at "L" level during PLAY and when released, , and at "H" level during FF, REW, and MS modes, and when mechanical deck changes occur. Pre-muting and post-muting functions are also included. The output changes as shown in the diagram.  Pre-muting Post-muting Muting Mechanical deck operations Key in 50ms 150ms
21	CW	Output	Loading motor control output. "H" level output generated when loading mechanism is switched to EJECT operation.
22	CCW	Output	Loading motor control output. "H" level output generated when loading mechanism is switched to LOADING operation.
23	POWER	Output	Deck audio circuit power supply ON/OFF switching control pin. "H" level output generated deck and LOADING operations.
24	$\overline{F}$/R	Output	Head amplifier direction switching signal output. "L" level for forward, "H" level for reverse.
25	ESENS	Input	End detection reel motor rotation pulse input pin. End is "detected" when "H" level is applied continuously for one second.
26、27	NC		
28	CST IN	Input	Loading operation switching input pin. If there is no cassette in the tape transport mechanism (pin 30 at "L" level) LOADING is started when "H" level is applied to this pin. And if "L" level is applied to this pin during EJECT operation, EJECT operation is stopped.
29	NC		
30	CST SET	Input	Loading operation switching input pin. If "H" level is applied to this pin during LOADING operation, the LOADING operation is stopped and deck operations are commenced. And if the pin is switched to "L" level during EJECT operation, deck operations are stopped.
31	Vss		GND
32	NC		Normally GND.
33	VDD		Power supply pin. 5V ± 10%
34、35	NC		
36	P/$\overline{MS}$	Output	MS operation filter switching output pin. "H" level for PLAY mode, "L" level for FF, REW, and MS modes.
37	TOUT	Output	System controller reference signal output pin. During PD4022 operation, a 100Hz, 50% duty output signal is generated.
38~40	NC		
41、42	$\overline{STH0}$、$\overline{STH1}$	Input	SCAN short time hold duration setting input pins. The hold duration is the number of seconds obtained by adding 12 to the data read from these pins.
43	AIMF	Input	Input pin for selecting the AIMF automatic "beginning of music" locating function where MS mode is started automatically at the end of ATSC with playback always started from the beginning when the deck is started.

<table>
<tr><th>Pin No.</th><th>Pin Name</th><th>I/O</th><th>Function and Operation</th></tr>
<tr><td>44</td><td>$\overline{\text{TEST}}$</td><td>Input</td><td>Test mode selector input pin. TEST mode is activated when the pin is reset by connecting to GND, and (0101) appears at all output pins.</td></tr>
<tr><td>45</td><td>NC</td><td></td><td></td></tr>
<tr><td>46</td><td>B·SOL</td><td>Output</td><td>Forward/reverse solenoid activator driver output pin.</td></tr>
<tr><td>47、48</td><td>F·SOL、R·SOL</td><td>Output</td><td>Forward/reverse solenoid activator output pins. An "H" level output is generated when a solenoid is activated.
<table>
<tr><th>Mechanical status</th><th>N · SOL</th><th>R · SOL</th></tr>
<tr><td>FF, REW, release</td><td>L</td><td>L</td></tr>
<tr><td>Forward PLAY</td><td>H</td><td>L</td></tr>
<tr><td>Reverse PLAY</td><td>L</td><td>H</td></tr>
<tr><td>MS</td><td>H</td><td>H</td></tr>
</table></td></tr>
<tr><td>49</td><td>CM·STP</td><td>Output</td><td>Capstan motor control output pin. Capstan motor is stopped by "H" level output. "H" level output is generated only during ATSC, resulting in the capstan motor being stopped.</td></tr>
<tr><td>50</td><td>FM·STP</td><td>Output</td><td>Forward direction reel motor control output pin.
Reel motor is stopped by "H" level output.</td></tr>
<tr><td>51</td><td>RM·STP</td><td>Output</td><td>Reverse direction reel motor control output pin.
Reel motor is stopped by "H" level output.</td></tr>
<tr><td>52</td><td>$\overline{\text{BK}}$</td><td>Output</td><td>Brake output pin. A 500ms "L" level output is generated when reel motor is switched from high speed FF and REW modes to low speed PLAY mode.</td></tr>
</table>

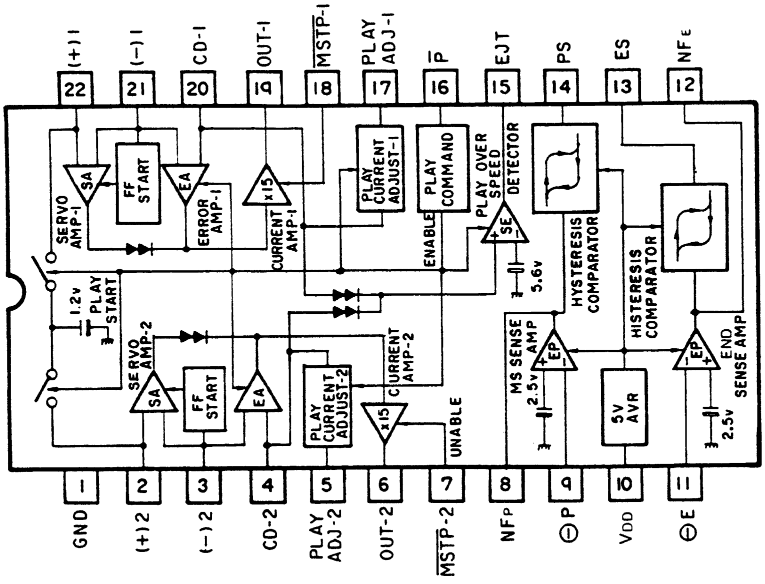
*Check the following items to determine whether PD4022 is operating or not.

1. Approximately 5V should be applied to pins 7 and 33.
2. Pin 3 should be at "L", but not connected to GND. 5V should be applied to pin 3 when the CLEAR button is pressed.
3. An oscillator output of about 200kHz should be applied to pin 9.
4. The following output waveforms should be observed at the respective pins (data transmission).

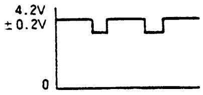
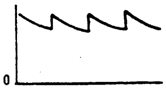
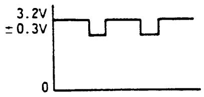

Pin 12、16
5V
0V



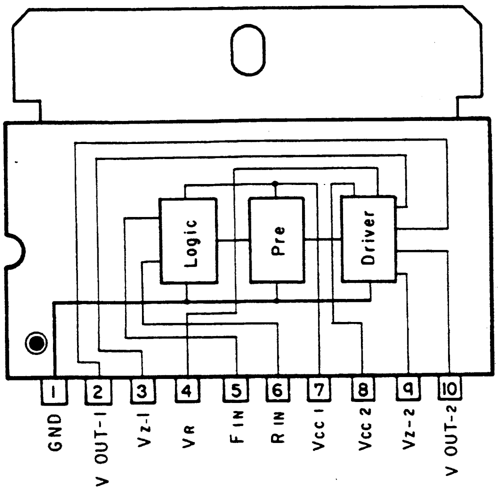
PA0008


(+)1
(−)1
CD-1
OUT-1
MSTP-1
PLAY ADJ-1
IP
EJT
PS
ES
NFE
22
21
20
19
18
17
16
15
14
13
12
SERVO AMP-1
SA
FF START
EA
ERROR AMP-1
x15
CURRENT AMP-1
PLAY CURRENT ADJUST-1
PLAY COMMAND
ENABLE
PLAY OVER SPEED DETECTOR
SE
5.6v
HYSTERESIS COMPARATOR
HISTERESIS COMPARATOR
1.2v
PLAY START
SERVO AMP-2
SA
FF START
EA
PLAY CURRENT ADJUST-2
CURRENT AMP-2
x15
UNABLE
MS SENSE AMP
2.5v
EP
5V AVR
EP
END SENSE AMP
2.5v
1
2
3
4
5
6
7
8
9
10
11
GND
(+)2
(−)2
CD-2
PLAY ADJ-2
OUT-2
MSTP-2
NFP
ΘP
VDD
ΘE

Pin Functions (PA0008)

Pin No.	Pin Name	I/O	Function and Operation
1	Vss		GND
2	(+) 2	Input	Servo amplifier non-inverted input pin. (Corresponds to reverse motor). PLAY mode  MS, FF, REW modes Changed to 2 – 8V  (Proportional to winding diameter)
3	(−) 2	Input	Servo amplifier inverted input pin. (Corresponds to reverse motor). (Operational waveforms and voltages are the same as for the (+)2 pin).
4	CD-2		Constant current in respect to external resistors during PLAY mode. PLAY mode 
5	PLAY ADJ-2	Input	Motor current during PLAY mode set by external resistance. PLAY mode: 1.4 to 1.7V (constant) MS, FF, REW modes: 2.5 to 5V
6	OUT-2	Output	Reverse motor drive transistor base driver. PLAY mode: 2.5 to 4V MS, FF, REW modes: 2.5 to 4.3V
7	$\overline{\mathrm{MSTP\text{-}2}}$	Input	Reverse motor STOP input pin. Motor stop mode: 0V Motor running mode: 0.7 to 1.0V
8	NF-P	Output	MUSIC signal amplifier output pin. A fixed voltage of about 2.5V is obtained when there is no MUSIC, while a amplified waveform centered at 2.5V appears when there is MUSIC.
9	⊖P	Input	MUSIC signal amplifier input pin used during music search mode.
10	Vcc		Power supply pin.
11	⊖E	Input	END SENSING amplifier input pin.
12	NF-E	Output	END SENSING amplifier output pin. A constant voltage of about 2.5V is generated when the forward and reverse motors are stopped, while an amplified waveform of the motor ripple voltage centered about 2.5V appears when one or both motors is/are turning.
13	ES	Output	END SENSING schmidt circuit output pin. Pulse waveforms of about 5V at "H" level and of about 0V at "L" level are generated synchronized with the motor ripple voltage while the motors are rotating. When both motors have stopped, "H" level is generated.
14	PS	Output	MUSIC SENSING schmidt circuit output pin. Pulse waveforms of about 5V at "H" level and of about 0V at "L" level are generated synchronized with the motor ripple voltage while music is detected during PLAY and MS modes. "H" level is generated during other modes.
15	EJT	Output	EJECT output pin for motor "runaway" status during PLAY mode. A constant current output is obtained if a motor "runaway" condition occurs during PLAY mode.
16	$\overline{\mathrm{P}}$	Input	PLAY mode switching input pin. Approx. 0V is applied during PLAY mode, and about 10V during other modes.
17	PLAY ADJ-1	Input	Same function and operation as pin 5, but for forward motor.
18	$\overline{\mathrm{MSTP\text{-}1}}$	Input	Forward motor stop input pin. Voltage is same as at pin 7.
19	OUT-1	Output	Same function and operation as pin 6, but for forward motor.
20	CD-1		Same function and operation as pin 4, but for forward motor.
21	(−) 1	Input	Same function and operation as pin 3, but for forward motor.
22	(+) 1	Input	Same function and operation as pin 2, but for forward motor.

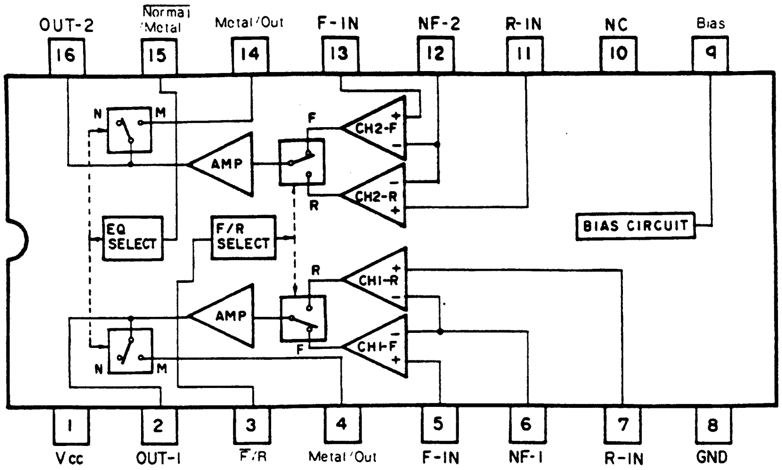
BA6209


Logic
Pre
Driver
1
2
3
4
5
6
7
8
9
10
GND
V OUT-1
Vz-1
VR
F IN
R IN
Vcc 1
Vcc 2
Vz-2
V OUT-2

Pin Functions (BA6209)

Pin No.	Pin Name	I/O	Function and Operation
1	GND		
2	Vout-1	Output	Motor pin.
3	Vz-1		Output delay pin.
4	VR		Motor voltage control pin.
5	F IN	Input	Motor rotating direction setting input. Load.
6	R IN	Input	Motor rotating direction setting input. Eject.
7	Vcc 1		Power supply.
8	Vcc 2		Power supply.
9	Vz-2		Output delay pin.
10	Vout-2	Output	Motor pin.

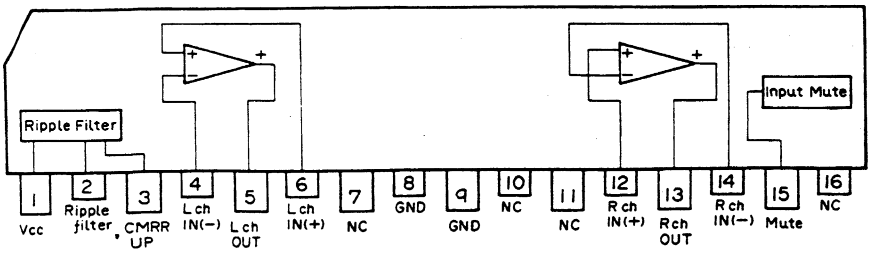
TA7705P


OUT-2
Normal/Metal
Metal/Out
F-IN
NF-2
R-IN
NC
Bias
16
15
14
13
12
11
10
9
N
M
F
CH2-F
AMP
CH2-R
R
EQ SELECT
F/R SELECT
BIAS CIRCUIT
R
CH1-R
AMP
CH1-F
F
N
M
1
2
3
4
5
6
7
8
Vcc
OUT-1
F/R
Metal/Out
F-IN
NF-1
R-IN
GND

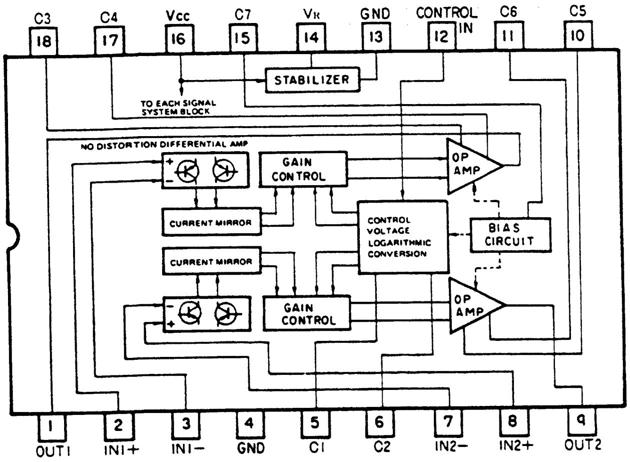
Pin Functions (TA7705P)

Pin No.	Pin Name	I/O	Function and Operation
1	Vcc		+B
2	OUT-1	Output	Left channel output.
3	$\overline{F}$/R		F/R switching pin (reverse at "H" level).
4	Metal/Out		METAL pin (left channel).
5	F-IN	Input	RL input.
6	NF-1		NF (left channel).
7	R-IN	Input	FL input.
8	GND		
9	Bias		Input bias pin.
10	NC		
11	R-IN	Input	FR input.
12	NF-2		NF (right channel).
13	F-IN	Input	RR input.
14	Metal/Out		METAL pin (right channel).
15	$\overline{\text{Normal}}$/Metal		METAL selector pin (METAL at "H" level)
16	OUT-2	Output	Right channel output.

PA2014


Ripple Filter
Input Mute
1 Vcc
2 Ripple filter
3 CMRR UP
4 Lch IN(−)
5 Lch OUT
6 Lch IN(+)
7 NC
8 GND
9 GND
10 NC
11 NC
12 Rch IN(+)
13 Rch OUT
14 Rch IN(−)
15 Mute
16 NC

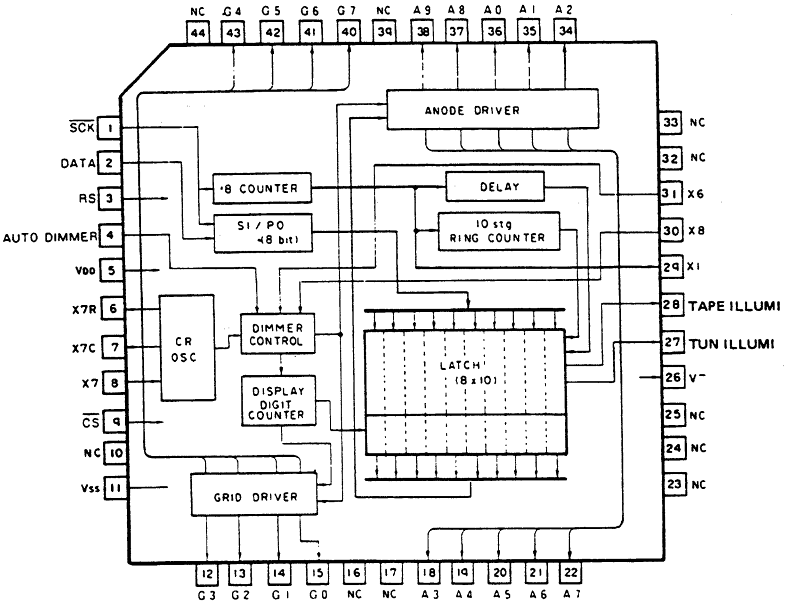
PA0005A


C3 18
C4 17
Vcc 16
C7 15
VR 14
GND 13
CONTROL IN 12
C6 11
C5 10
STABILIZER
TO EACH SIGNAL SYSTEM BLOCK
NO DISTORTION DIFFERENTIAL AMP
GAIN CONTROL
OP AMP
CURRENT MIRROR
CONTROL VOLTAGE LOGARITHMIC CONVERSION
BIAS CIRCUIT
CURRENT MIRROR
GAIN CONTROL
OP AMP
1 OUT1
2 IN1+
3 IN1−
4 GND
5 C1
6 C2
7 IN2−
8 IN2+
9 OUT2

Pin Functions (PA0005A)

Pin No.	Pin Name	I/O	Function and Operation
1	OUT 1	Output	Channel 1 output
2	IN 1 +	Input	Channel 1 differential inputs
3	IN 1 −	Input	
4	GND		GND
5	C 1		Bypass capacitors for the control voltage logarithmic conversion circuit
6	C 2		
7	IN 2 −	Input	Channel 2 differential inputs
8	IN 2 +	Input	
9	OUT 2	Output	Channel 2 output
10	C 5		Channel 2 output amplifier phase compensation
11	C 6		
12	CONTROL IN	Input	Control voltage input
13	GND		GND
14	VR		For stabilized circuits
15	C 7		Bias circuit filter
16	Vcc		Vcc
17	C 4		Channel 1 output amplifier phase compensation
18	C 3		

***PD7005**


NC
G4
G5
G6
G7
NC
A9
A8
A0
A1
A2
44
43
42
41
40
39
38
37
36
35
34
ANODE DRIVER
SCK 1
DATA 2
RS 3
AUTO DIMMER 4
VDD 5
X7R 6
X7C 7
X7 8
CS 9
NC 10
Vss 11
÷8 COUNTER
SI / PO (8 bit)
DELAY
10 stg RING COUNTER
CR OSC
DIMMER CONTROL
DISPLAY DIGIT COUNTER
LATCH (8 x 10)
GRID DRIVER
33 NC
32 NC
31 X6
30 X8
29 X1
28 TAPE ILLUMI
27 TUN ILLUMI
26 V−
25 NC
24 NC
23 NC
12
13
14
15
16
17
18
19
20
21
22
G3
G2
G1
G0
NC
NC
A3
A4
A5
A6
A7

Pin Functions (PD7005)

Pin No.	Pin Name	I/O	Function and Operation
1	$\overline{\text{SCK}}$	Input	Serial interface system clock input pin. Active "L".
2	DATA	Input	Data input pin
3	RS		Reset pin
4	AUTO DIMMER		Not used
5	VDD		Power supply pin. 5V ± 0.3V
6 ~ 8			For oscillator circuit
9	$\overline{\text{CS}}$	Input	Chip selector signal input pin. Active "L".
10	NC		
11	Vss		GND
12~15	G3~ G0	Output	FL grid outputs
16、17	NC		
18~22	A3~A 7	Output	FL anode outputs
23~25	NC		
26	V−	Output	Grid output. Negative voltage Output pin for pull-down resistance.
27	TUN ILLUMI.	Output	TUN illuminator ON output pin ("H" level)
28	TAPE ILLUMI.	Output	TAPE illuminator ON output pin ("H" level)
29~31			Not used
32、33	NC		
34~36	A2~A0	Output	FL anode outputs
37、38	A8、A9	Output	
39	NC		
40~43	G7~G4	Output	FL grid outputs
44	NC		

ELECTR ICAL PARTS LIST

Control Unit (CWX-528)

MISCELLANEOUS

Mark	Symbol & Description	Part No.
**	IC1	PD4022B or PD4022A
**	IC2	PD4050B
**	IC3	PA0008
**	IC4	PA2014
**	Q1, Q2, Q6, Q7	2SA900
**	Q3	2SD1062
**	Q5	2SC1568
**	Q8	2SB952
**	Q9	2SC2634NC
**	Q10 – Q15, Q17 – Q23, Q25, Q30 – Q42, Q45 – Q54 Chip Transistor	2SC2712-LG or 2SC2712-LL or 2SC2712-LY or 2SD601-YQ or 2SD601-YR or 2SD601-YS
**	Q16, Q24, Q26 – Q29, Q56 Chip Transistor	2SB709-AQ or 2SB709-AR or 2SB709-AS or 2SA1179-M5 or 2SA1179-M6 or 2SA1179-M7
*	D1 – D4, D9 – D12	US1040 or 1S1555 or 1S2076
*	D5	1S1886 or SIB01-01 or SIB01-02
*	D6, D7	RD6R8JB3
*	D14 Chip Diode	MA151A
*	D13, D16 Chip Diode	MA153
*	D15 Chip Diode	MA3043
*	D17, C19, D20, D24 Chip Diode	MA151WK
*	D18, D22, D25, D33 – D36, D38 – D42 Chip Diode	MA151K
*	D21, D26, D31 Chip Diode	MA3062
*	D23, D29 Chip Diode	MA3047
*	D27, C37 Chip Diode	MA3100
*	D28 Chip Diode	MA151WA
*	D30 Chip Diode	MA3200
*	D32 Chip Diode	MA3091
	L1 Transformer	CTX-073
	L2 Ferri-Inductor	CTF-078
	PO1 Posistor	CCX-010
	VC1 Trimmer	CCG-070
**	VR1, VR2 Semi-fixed, 1kΩ (B)	CCP-239
**	VR3, VR4 Semi-fixed, 3.3kΩ (B)	CCP-242
	X1 Buzzer	CPV-031
	X2 X'tal	CSS-029

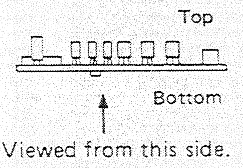
RESISTORS

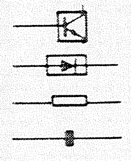
Mark	Symbol & Description	Part No.
	R1 – R4 5.1kΩ	CCN-099
	R5, R6 2.7kΩ	CCN-110
	R7, R116, R208	RD1/4VM □□□J
	R8, R9	RD1/4PM □□□J
	Other Resistors (Chip Resistor)	RS1/8S □□□J

CAPACITORS

Mark	Symbol & Description	Part No.
	C1 – C4, C15	CEA010M50L2
	C5, C17	CEA471M10L2
	C6, C16	CEA100M16L2
	C7, C8	CEA2R2M50L2
	C9, C10	CEA0R1M50L2
	C11 – C14	CEA010M35NP
	C18	CEA331M16L2
	C19	CEA330M35LL
	C20	CEA101M35L2
	C21	CEA2R2M35LS
	C22, C52 Chip Capacitor	CKSYB102K50
	C23, C27 – C30 Chip Capacitor	CKSYF473Z50
	C24, C34, C44 Chip Capacitor	CCSCH330J50
	C25, C26 Chip Capacitor	CKSYF154Z25
	C31 Chip Capacitor	CKSYB682K50
	C32 Chip Capacitor	CCSCH560J50
	C33 Chip Capacitor	CKSYB272K50
	C35 Chip Capacitor	CKSYB472K50
	C36 – C42, C45 – C48, C53 – C61 Chip Capacitor	CKSYB222K50
	C49 Chip Capacitor	CKSYB223K50
	C50, C51 Chip Capacitor	CCSSL102J50
	C62 Chip Capacitor	CKSYB473K25
	C63	CEA470M6R3LS

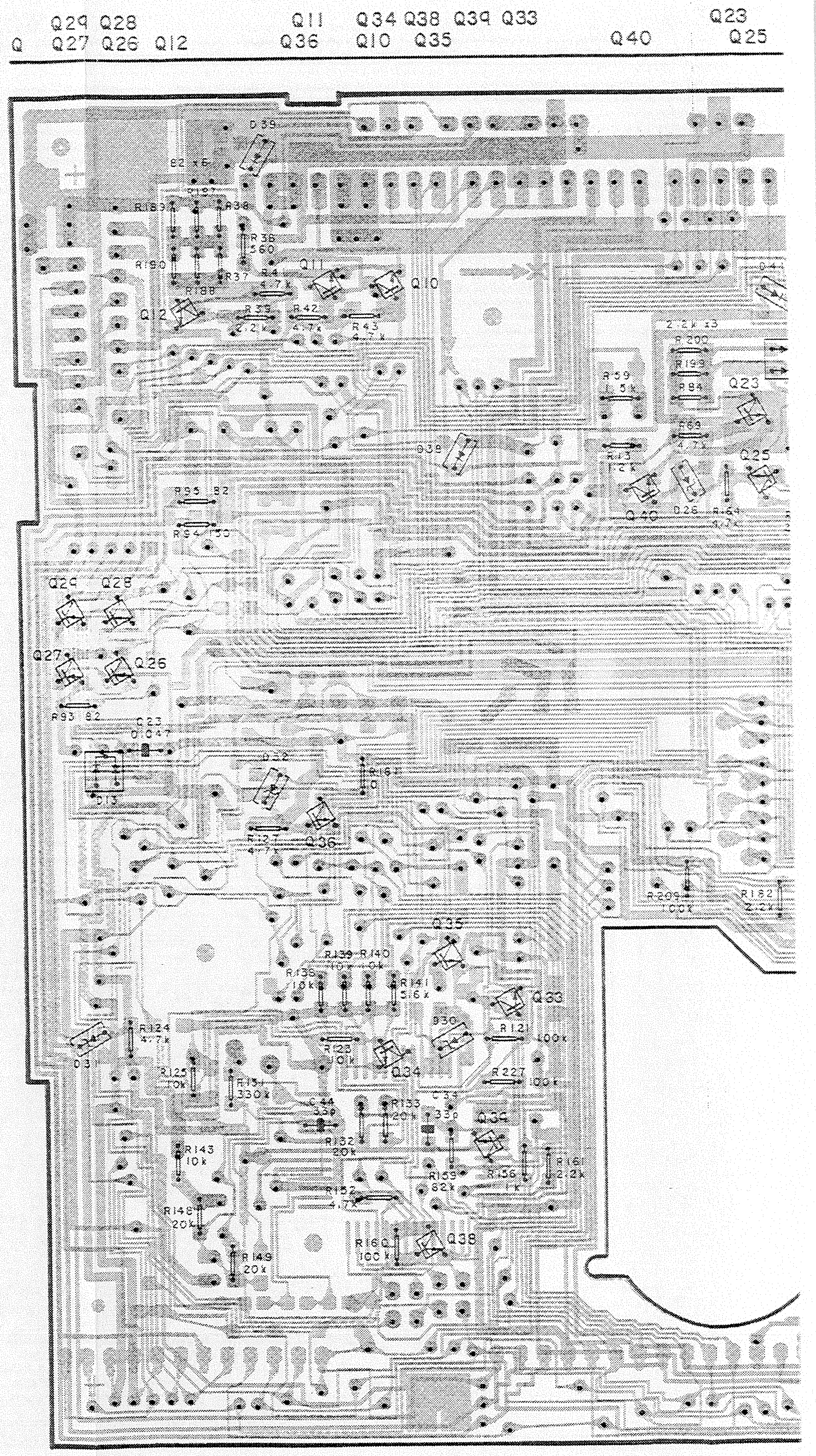
- Parts mounted onto the control unit are listed separately in the following manner.
  Page 73: Chip parts installed on the bottom of the P.C board.
  Page 75: Parts other than the chip parts installed on the bottom.



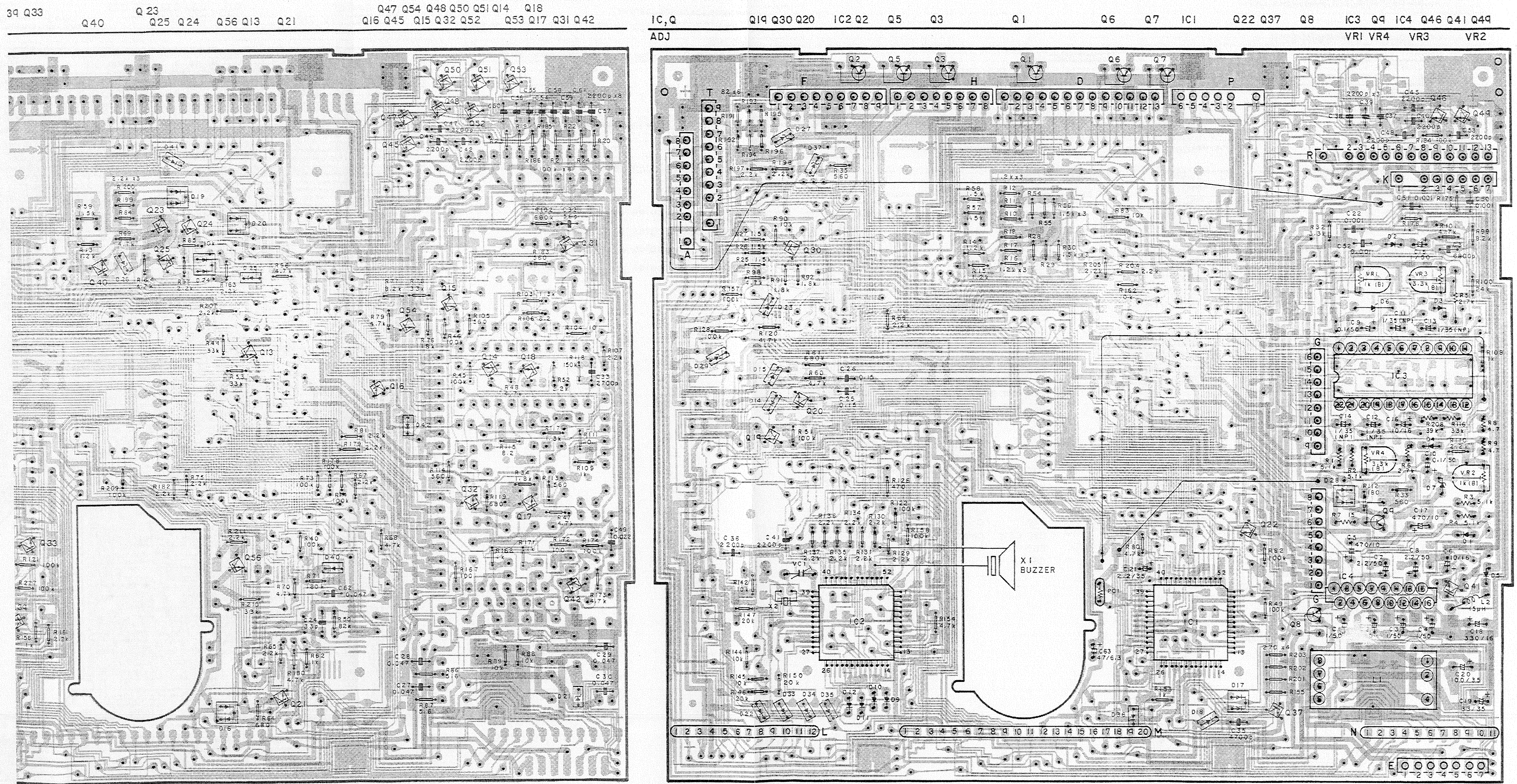


Indicates a chip transistor
Indicates a chip diode
Indicates a chip resistor
Indicates a chip capacitor

CONTROL UNIT (CWX-528)



Q10 ~ 15, 17, 18, 21, 23, 25, 31 ~ 36, 38 ~ 40, 42, 45, 47, 48, 50 ~ 54 : 2SC2
Q16, 24, 26 ~ 29, 56 : 2SB709 – AQ or 2SA1179 – M5
D13, 16 : MA153 D19, 20, 24 : MA151WK D21, 26, 31 : MA3062


39 Q33
Q40
Q 23
Q25 Q24
Q56 Q13
Q21
Q47 Q54 Q48 Q50 Q51 Q14 Q18
Q16 Q45 Q15 Q32 Q52
Q53 Q17 Q31 Q42
IC, Q
ADJ
Q19 Q30 Q20
IC2 Q2
Q5
Q3
Q1
Q6
Q7
IC1
Q22 Q37
Q8
IC3 Q9 IC4 Q46 Q41 Q49
VR1 VR4 VR3 VR2
X1
BUZZER

42, 45, 47, 48, 50 ~ 54 : 2SC2712 − LG or 2SD601 − YQ
1179 − M5
WK D21, 26, 31 : MA3062 D25, 38 ~ 42 : MA151K D30 : MA3200 D32 : MA3091

IC1 : PD4022B or PD4022A IC2 : PD4050B IC3 : PA0008 IC4 : PA2014
Q1, 2, 6, 7 : 2SA900 Q3 : 2SD1062 Q5 : 2SC1568 Q8 : 2SB952 Q9 : 2SC2634NC Q19, 20, 22, 30, 37, 41, 46, 49 : 2SC2712 − LG or 2SD601 − YQ
D1 ~ 4, 9 ~ 12 : US1040, 1S1555 or 1S2076 D5 : 1S1886, SIB01 − 01 or SIB01 − 02 D6, 7 : RD6R8JB3 D14 : MA151A D15 : MA3043 D17 : MA151WK
D18, 22, 33 ~ 36 : MA151K D23, 29 : MA3047 D27, 37 : MA3100 D28 : MA151WA

Fig. 54

1 2 3 4 5 6

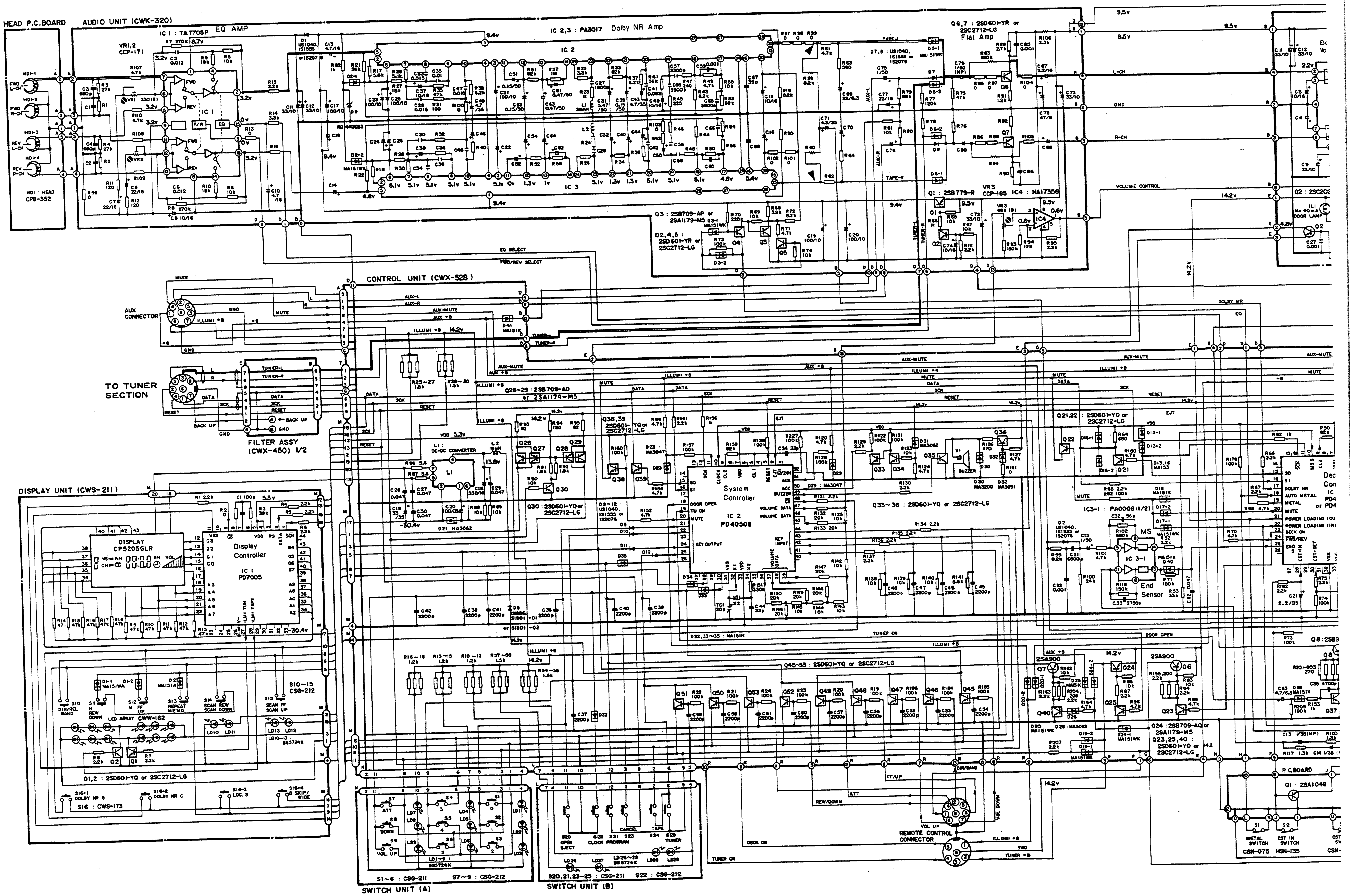
9. SCHEMATIC CIRCUIT DIAGRAM (CONTROL SECTION)

A

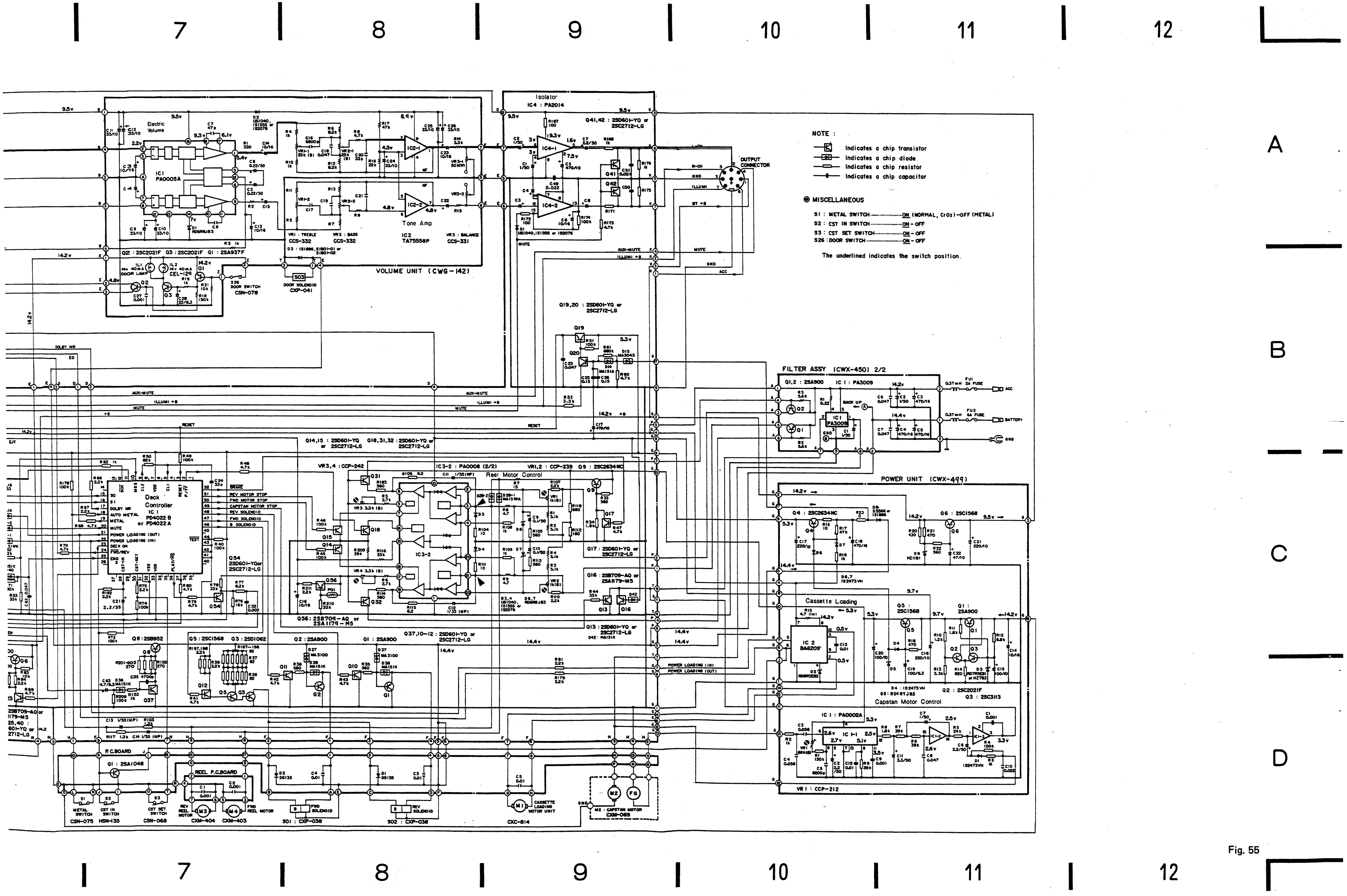
B

C

D


HEAD P.C.BOARD
AUDIO UNIT (CWK-320)
IC 1 : TA7705P EQ AMP
VR1,2 CCP-171
HDI HEAD CPB-352
IC 2,3 : PA3017 Dolby NR Amp
IC 2
IC 3
Q6,7 : 2SD601-YR or 2SC2712-LG Flat Amp
Q3 : 2SB709-AP or 2SA1179-M5
Q2,4,5 : 2SD601-YR or 2SC2712-LG
Q1 : 2SB779-R
VR3 CCP-185
IC4 : HA17358
VOLUME CONTROL
EQ SELECT
FWD/REV SELECT
CONTROL UNIT (CWX-528)
AUX CONNECTOR
TO TUNER SECTION
FILTER ASSY (CWX-450) 1/2
Q26~29 : 2SB709-AQ or 2SA1174-M5
DC-DC CONVERTER
Q30 : 2SD601-YQ or 2SC2712-LG
Q38,39 : 2SD601-YQ or 2SC2712-LG
System Controller
IC 2 PD4050B
BUZZER
Q33~36 : 2SD601-YQ or 2SC2712-LG
Q21,22 : 2SD601-YQ or 2SC2712-LG
IC3-1 : PA0008 (1/2)
End Sensor
DISPLAY UNIT (CWS-211)
DISPLAY CP5205GLR
Display Controller
IC 1 PD7005
LED ARRAY CWW-162
S10~15 CSG-212
Q1,2 : 2SD601-YQ or 2SC2712-LG
S16 : CWS-173
Q45~53 : 2SD601-YQ or 2SC2712-LG
Q24 : 2SB709-AQ or 2SA1179-M5
Q23,25,40 : 2SD601-YQ or 2SC2712-LG
REMOTE CONTROL CONNECTOR
S1~6 : CSG-211
S7~9 : CSG-212
SWITCH UNIT (A)
S20,21,23~25 : CSG-211
S22 : CSG-212
SWITCH UNIT (B)
P.C.BOARD
Q1 : 2SA1048
METAL SWITCH CSN-075
CST IN SWITCH HSN-135

1 2 3 4 5 6


7
8
9
10
11
12
A
B
C
D
Electric Volume
IC1 PA0005A
Tone Amp
IC2 TA75558P
VR1 : TREBLE CCS-332
VR2 : BASS CCS-332
VR3 : BALANCE CCS-331
VOLUME UNIT (CWG-142)
Isolator
IC4 : PA2014
Q41,42 : 2SD601-YQ or 2SC2712-LG
OUTPUT CONNECTOR
Q2 : 2SC2021F Q3 : 2SC2021F Q1 : 2SA937F
DOOR LAMP
S26 DOOR SWITCH CSN-078
DOOR SOLENOID CXP-041
Q19,20 : 2SD601-YQ or 2SC2712-LG
FILTER ASSY (CWX-450) 2/2
Q1,2 : 2SA900
IC 1 : PA3009
BACK UP
ACC
BATTERY
GND
Deck Controller
IC 1
PD4022 B
or PD4022 A
Q54 2SD601-YQor 2SC2712-LG
Q14,15 : 2SD601-YQ or 2SC2712-LG
Q18,31,32 : 2SD601-YQ or 2SC2712-LG
VR3,4 : CCP-242
IC3-2 : PA0008 (2/2)
Reel Motor Control
VR1,2 : CCP-239
Q9 : 2SC2634NC
Q17 : 2SD601-YQ or 2SC2712-LG
Q16 : 2SB709-AQ or 2SA1179-M5
Q13 : 2SD601-YQ or 2SC2712-LG
Q56 : 2SB709-AQ or 2SA1179-M5
Q37,10-12 : 2SD601-YQ or 2SC2712-LG
Q8 : 2SB952
Q5 : 2SC1568 Q3 : 2SD1062
Q2 : 2SA900
Q1 : 2SA900
POWER UNIT (CWX-499)
Q4 : 2SC2634NC
Q6 : 2SC1568
Cassette Loading
IC 2 BA6209
Q5 : 2SC1568
Q1 : 2SA900
Q2 : 2SC2021F
Q3 : 2SC3113
Capstan Motor Control
IC 1 : PA0002A
VR 1 : CCP-212
P.C.BOARD
Q1 : 2SA1048
REEL P.C.BOARD
S1 METAL SWITCH CSN-075
S2 CST IN SWITCH HSN-135
S3 CST SET SWITCH CSN-068
REV REEL MOTOR CXM-404
FWD REEL MOTOR CXM-403
FWD SOLENOID
S01 : CXP-038
REV SOLENOID
S02 : CXP-038
CASSETTE LOADING MOTOR UNIT CXC-814
M2 : CAPSTAN MOTOR CXM-069
AUX-MUTE
ILLUMI +B
MUTE
RESET
POWER LOADING (IN)
POWER LOADING (OUT)

NOTE :

- Indicates a chip transistor
- Indicates a chip diode
- Indicates a chip resistor
- Indicates a chip capacitor

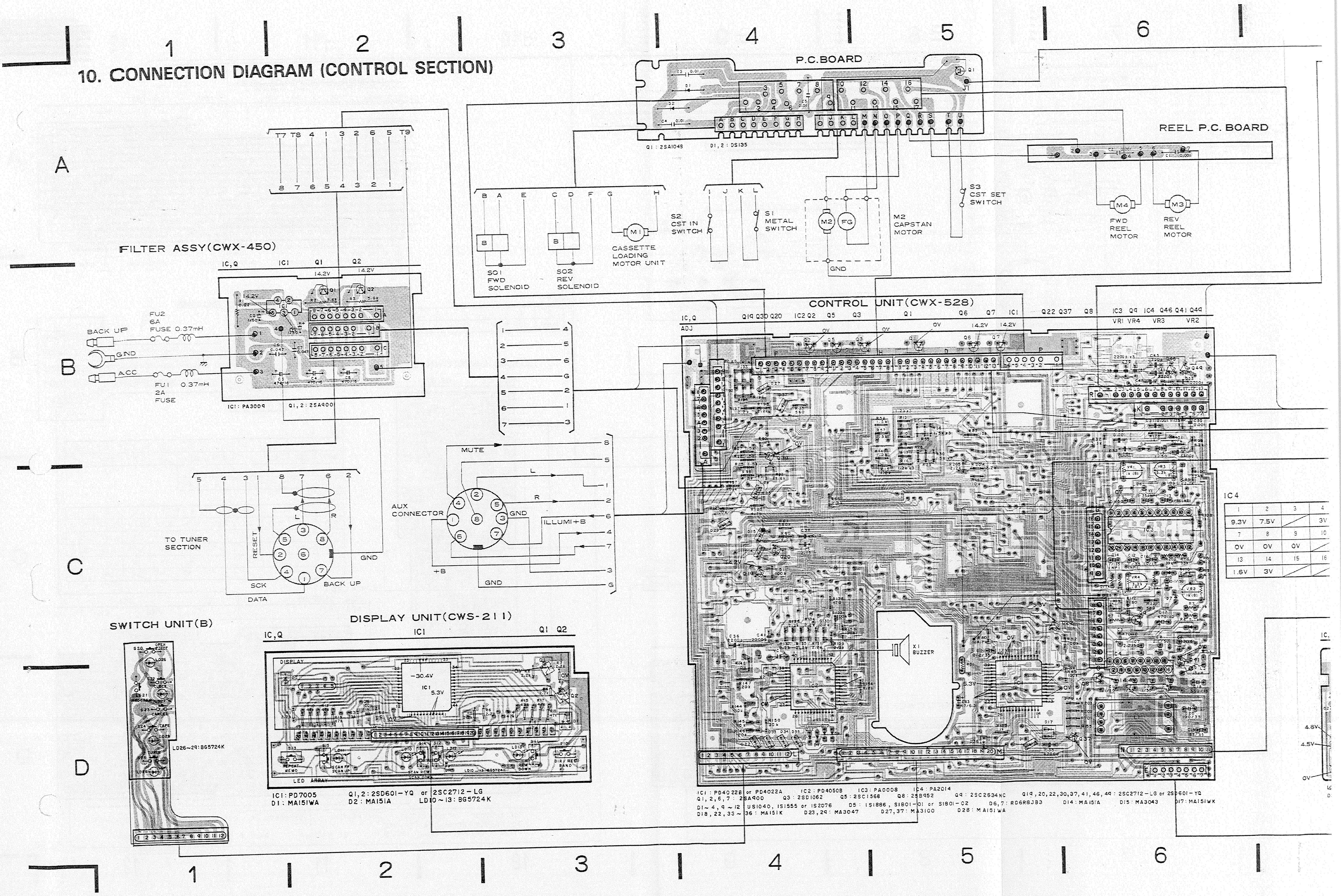
◉ MISCELLANEOUS

S1 : METAL SWITCH .... ON (NORMAL, CrO_2)–OFF (METAL)
S2 : CST IN SWITCH .... ON - OFF
S3 : CST SET SWITCH .... ON - OFF
S26 : DOOR SWITCH .... ON - OFF

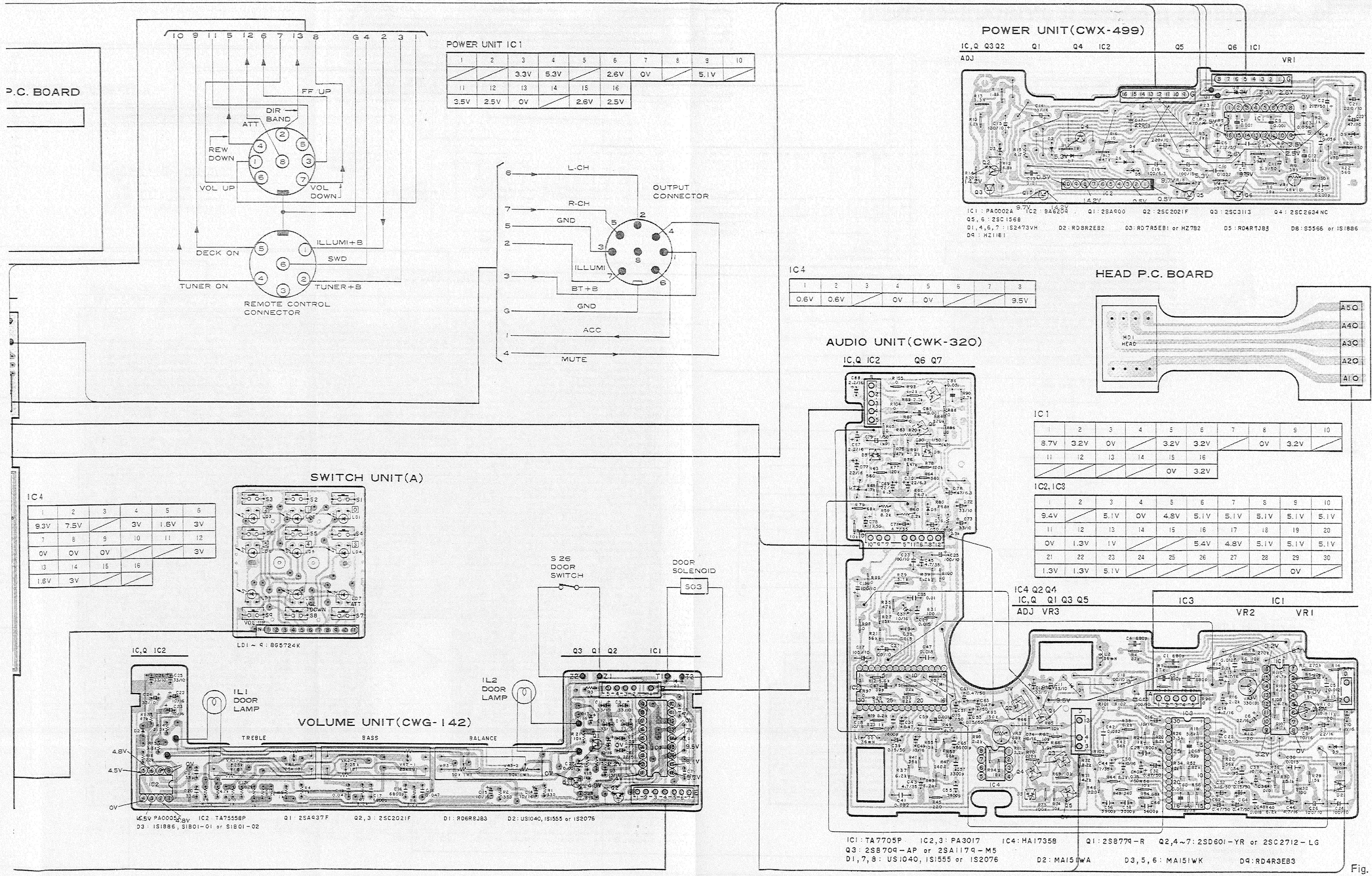
The underlined indicates the switch position.

Fig. 55

10. CONNECTION DIAGRAM (CONTROL SECTION)


1
2
3
4
5
6
A
B
C
D
P.C.BOARD
Q1 : 2SA1048
D1, 2 : DS135
REEL P.C. BOARD
T7 T8 4 1 3 2 6 5 T9
8 7 6 5 4 3 2 1
B A E
C D F
G H
SO1
FWD
SOLENOID
SO2
REV
SOLENOID
M1
CASSETTE
LOADING
MOTOR UNIT
S2
CST IN
SWITCH
S1
METAL
SWITCH
I J K L
M2
FG
M2
CAPSTAN
MOTOR
GND
S3
CST SET
SWITCH
M4
FWD
REEL
MOTOR
M3
REV
REEL
MOTOR
FILTER ASSY(CWX-450)
IC, Q
IC1
Q1
Q2
14.2V
14.2V
4.2V
BACK UP
FU2
6A
FUSE 0.37mH
GND
ACC
FU1 0.37mH
2A
FUSE
IC1 : PA3009
Q1, 2 : 2SA900
1 2 3 4 5 6 7
4 5 6 G 2 1 3
MUTE
8
5
L
1
R
2
AUX
CONNECTOR
GND
6
ILLUMI+B
4
7
3
G
+B
GND
5 4 3 1 8 7 6 2
L
R
TO TUNER
SECTION
RESET
GND
SCK
DATA
BACK UP
CONTROL UNIT(CWX-528)
IC, Q
ADJ
Q19 Q30 Q20
IC2 Q2
Q5
Q3
Q1
Q6
Q7
IC1
Q22 Q37
Q8
IC3 Q9 IC4 Q46 Q41 Q49
VR1 VR4 VR3 VR2
OV
14.2V
14.2V
X1
BUZZER
5.3V
1 2 3 4 5 6 7 8 9 10 11 12 L
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 M
N 1 2 3 4 5 6 7 8 9 10 11
E 1 2 3 4 5 6 7
IC1 : PD4022B or PD4022A
IC2 : PD4050B
IC3 : PA0008
IC4 : PA2014
Q1, 2, 6, 7 : 2SA900
Q3 : 2SD1062
Q5 : 2SC1568
Q8 : 2SB952
Q9 : 2SC2634NC
Q19, 20, 22, 30, 37, 41, 46, 49 : 2SC2712-LG or 2SD601-YQ
D1 ~ 4, 9 ~ 12 : US1040, 1S1555 or 1S2076
D5 : 1S1886, S1801-01 or S1801-02
D6, 7 : RD6R8JB3
D14 : MA151A
D15 : MA3043
D17 : MA151WK
D18, 22, 33 ~ 36 : MA151K
D23, 29 : MA3047
D27, 37 : MA3100
D28 : MA151WA
SWITCH UNIT(B)
S20
OPEN
EJECT
S23
CANCEL
S24
TAPE
LD26 ~ 29 : BG5724K
1 2 3 4 5 6 7 8 9 10 11 12
DISPLAY UNIT(CWS-211)
IC, Q
IC1
Q1 Q2
DISPLAY
-30.4V
IC1
5.3V
S13
REPEAT
MEMO
S15
SCAN FF
SCAN UP
SCAN REW
SCAN DOWN
REV
DOWN
DIR/REC
BAND
LED ARRAY
LD10 ~ 13 : BG5724K
IC1 : PD7005
D1 : MA151WA
Q1, 2 : 2SD601-YQ or 2SC2712-LG
D2 : MA151A
LD10 ~ 13 : BG5724K
IC,
4.8V
4.5V
OV
IC4

1	2	3	4
9.3V	7.5V		3V
7	8	9	10
OV	OV	OV	
13	14	15	16
1.6V	3V		


P.C. BOARD
REMOTE CONTROL CONNECTOR
DIR
BAND
ATT
FF UP
REW DOWN
VOL UP
VOL DOWN
DECK ON
ILLUMI+B
SWD
TUNER ON
TUNER+B
OUTPUT CONNECTOR
L-CH
R-CH
GND
ILLUMI
BT+B
ACC
MUTE
POWER UNIT(CWX-499)
IC,Q Q3 Q2 Q1 Q4 IC2 Q5 Q6 IC1
ADJ VR1
HEAD P.C. BOARD
HD1 HEAD
A5 A4 A3 A2 A1
AUDIO UNIT(CWK-320)
IC,Q IC2 Q6 Q7
IC4 Q2 Q4
IC,Q Q1 Q3 Q5 IC3 IC1
ADJ VR3 VR2 VR1
SWITCH UNIT(A)
LD1 ~ 9 : BG5724K
S26 DOOR SWITCH
DOOR SOLENOID
SO3
IL1 DOOR LAMP
IL2 DOOR LAMP
VOLUME UNIT(CWG-142)
IC,Q IC2
Q3 Q1 Q2 IC1
TREBLE
BASS
BALANCE
A B C D

POWER UNIT IC1

1	2	3	4	5	6	7	8	9	10
		3.3V	5.3V		2.6V	0V		5.1V	
11	12	13	14	15	16				
3.5V	2.5V	0V		2.6V	2.5V				

IC1 : PA0002A IC2 : BA6204 Q1 : 2SA900 Q2 : 2SC2021F Q3 : 2SC3113 Q4 : 2SC2634NC
Q5, 6 : 2SC1568
D1, 4, 6, 7 : 1S2473VH D2 : RD8R2EB2 D3 : RD7R5EB1 or HZ7B2 D5 : RD4R7JB3 D8 : S5566 or 1S1886
D9 : HZ11B1

IC4

1	2	3	4	5	6	7	8
0.6V	0.6V		0V	0V			9.5V

IC1

1	2	3	4	5	6	7	8	9	10
8.7V	3.2V	0V		3.2V	3.2V		0V	3.2V	
11	12	13	14	15	16				
				0V	3.2V				

IC2, IC3

1	2	3	4	5	6	7	8	9	10
9.4V		5.1V	0V	4.8V	5.1V	5.1V	5.1V	5.1V	5.1V
11	12	13	14	15	16	17	18	19	20
0V	1.3V	1V			5.4V	4.8V	5.1V	5.1V	5.1V
21	22	23	24	25	26	27	28	29	30
1.3V	1.3V	5.1V						0V	

IC1 : TA7705P IC2, 3 : PA3017 IC4 : HA17358 Q1 : 2SB779-R Q2, 4~7 : 2SD601-YR or 2SC2712-LG
Q3 : 2SB709-AP or 2SA1179-M5
D1, 7, 8 : US1040, 1S1555 or 1S2076 D2 : MA151WA D3, 5, 6 : MA151WK D9 : RD4R3EB3

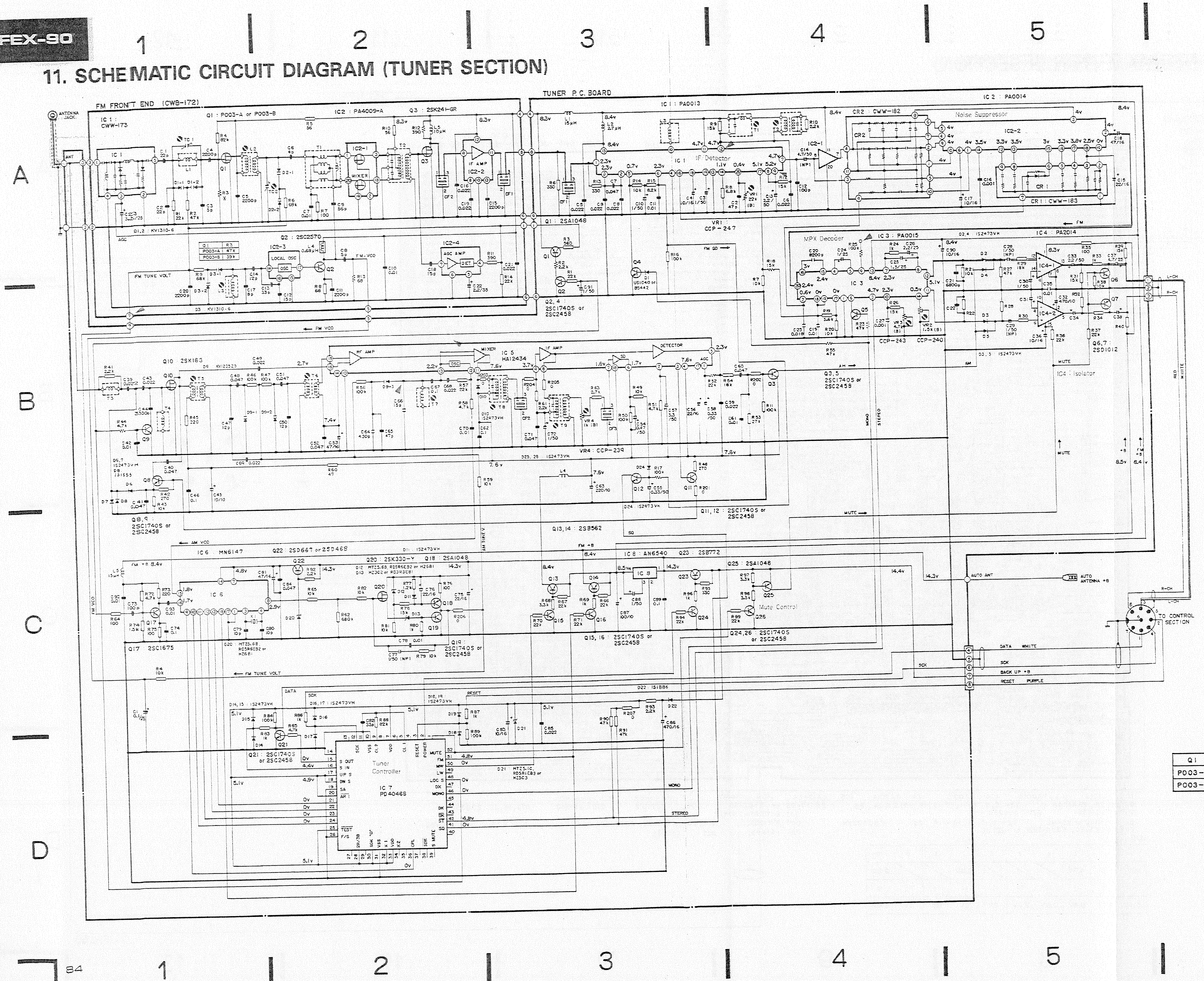
IC4

1	2	3	4	5	6
9.3V	7.5V		3V	1.6V	3V
7	8	9	10	11	12
0V	0V	0V			3V
13	14	15	16		
1.6V	3V				

IC1 : PA0005A IC2 : TA75558P Q1 : 2SA937F Q2, 3 : 2SC2021F D1 : RD6R8JB3 D2 : US1040, 1S1555 or 1S2076
D3 : 1S1886, S1B01-01 or S1B01-02

Fig. 56

11. SCHEMATIC CIRCUIT DIAGRAM (TUNER SECTION)


1
2
3
4
5
6
A
B
C
D
TUNER P.C. BOARD
FM FRONT END (CWB-172)
ANTENNA JACK
IC1: CWW-173
Q1: P003-A or P003-B
IC2: PA4009-A
Q3: 2SK241-GR
MIXER
IF AMP
D1,2: KV1310-6
AGC
Q2: 2SC2570
LOCAL OSC
AGC AMP
DET
FM TUNE VOLT
D3 KV1310-6
FM VCO
IC1: PA0013
IF Detector
VR1: CCP-247
Q1: 2SA1048
Q2,4: 2SC1740S or 2SC2458
IC2: PA0014
CR2 CWW-182
Noise Suppressor
CR1: CWW-183
IC3: PA0015
MPX Decoder
IC4: PA2014
Q6,7: 2SD1012
IC4: Isolator
MUTE
CCP-243
CCP-240
L-CH
R-CH
Q10 2SK163
IC5 HA12434
RF AMP
DETECTOR
VR4: CCP-239
Q3,5 2SC1740S or 2SC2458
Q8,9 2SC1740S or 2SC2458
Q11,12: 2SC1740S or 2SC2458
Q13,14: 2SB562
IC6 MN6147
Q22: 2SD667 or 2SD468
Q20: 2SK330-Y
Q18: 2SA1048
IC8: AN6540
Q23: 2SB772
Q25: 2SA1048
AUTO ANT
AUTO ANTENNA +B
Mute Control
Q24,26: 2SC1740S or 2SC2458
Q15,16: 2SC1740S or 2SC2458
Q19: 2SC1740S or 2SC2458
Q17 2SC1675
AM VCO
Tuner Controller
IC7 PD4046B
Q21: 2SC1740S or 2SC2458
D22 1S1886
MONO
STEREO
RED
WHITE
DATA WHITE
SCK
BACK UP +B
RESET PURPLE
TO CONTROL SECTION

Q1	R3
P003-A	47k
P003-B	39k

12. CONN

IC1

1	2	3	4	5	6	7	
2.3V		2.3V	0V	0.7V	2.3V	4.7V	5.
11	12	13	14	15	16	17	
4.7V	4.7V	0V	1.1V	8.4V		5.1V	

IC2

1	2	3	4	5	6	7	
4V	4V	4V	4V	4V	4V		
11	12	13	14	15	16	17	
8.4V	3.3V	3.5V	3.5V	3V	3.3V	3.8V	2.

IC4

1	2	3	4	5	6	7	
8.3V						0V	
9	10	11	12	13	14	15	
0V	0V						

IC5

1	2	3	4	5	6	7	
			7.6V	2.3V	1.7V	1.6V	
11	12	13	14	15	16	17	
7.6V		2.2V	7.4V		2.7V		

FM FRONT END(CWB-172)

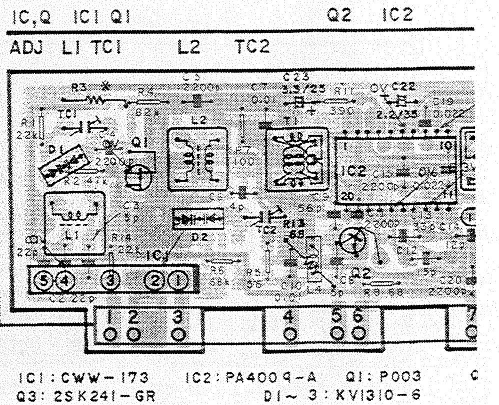

IC,Q
IC1 Q1
Q2
IC2
ADJ
L1 TC1
L2
TC2
R3
R4 82k
C5 2200p
C7 0.01
C23 3.3/25
R11 390
C22 2.2/35
C19 0.022
R1 22k
TC1
C4 2200p
D1
Q1
R2 47k
T1
R7 100
IC2
C15 2200p
C16 0.022
L1
C3 3p
R14 22k
D2
C6 4p
TC2
R13 68
C9 56p
Q2
R5 68k
R8 68
C2 22p
1 2 3
4 5 6
IC1: CWW-173
IC2: PA4009-A
Q1: P003
Q3: 2SK241-GR
D1~3: KV1310-6

Fig. 57

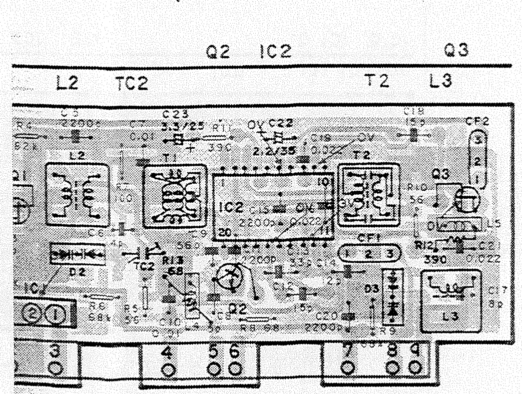
12. CONNECTION DIAGRAM (TUNER SECTION)

	3	4	5	6	7	8	9	10
/	2.3V	0V	0.7V	2.3V	4.7V	5.2V	5.2V	/
2	13	14	15	16	17	18	19	20
7V	0V	1.1V	8.4V	/	5.1V	/	/	0.4V

	3	4	5	6	7	8	9	10
V	4V	4V	4V	4V	/	/	4V	4V
2	13	14	15	16	17	18	19	20
3V	3.5V	3.5V	3V	3.3V	3.8V	2.5V	0V	0V

	3	4	5	6	7	8
/	/	/	/	/	0V	0V
0	11	12	13	14	15	16
V	/	/	/	/	/	/

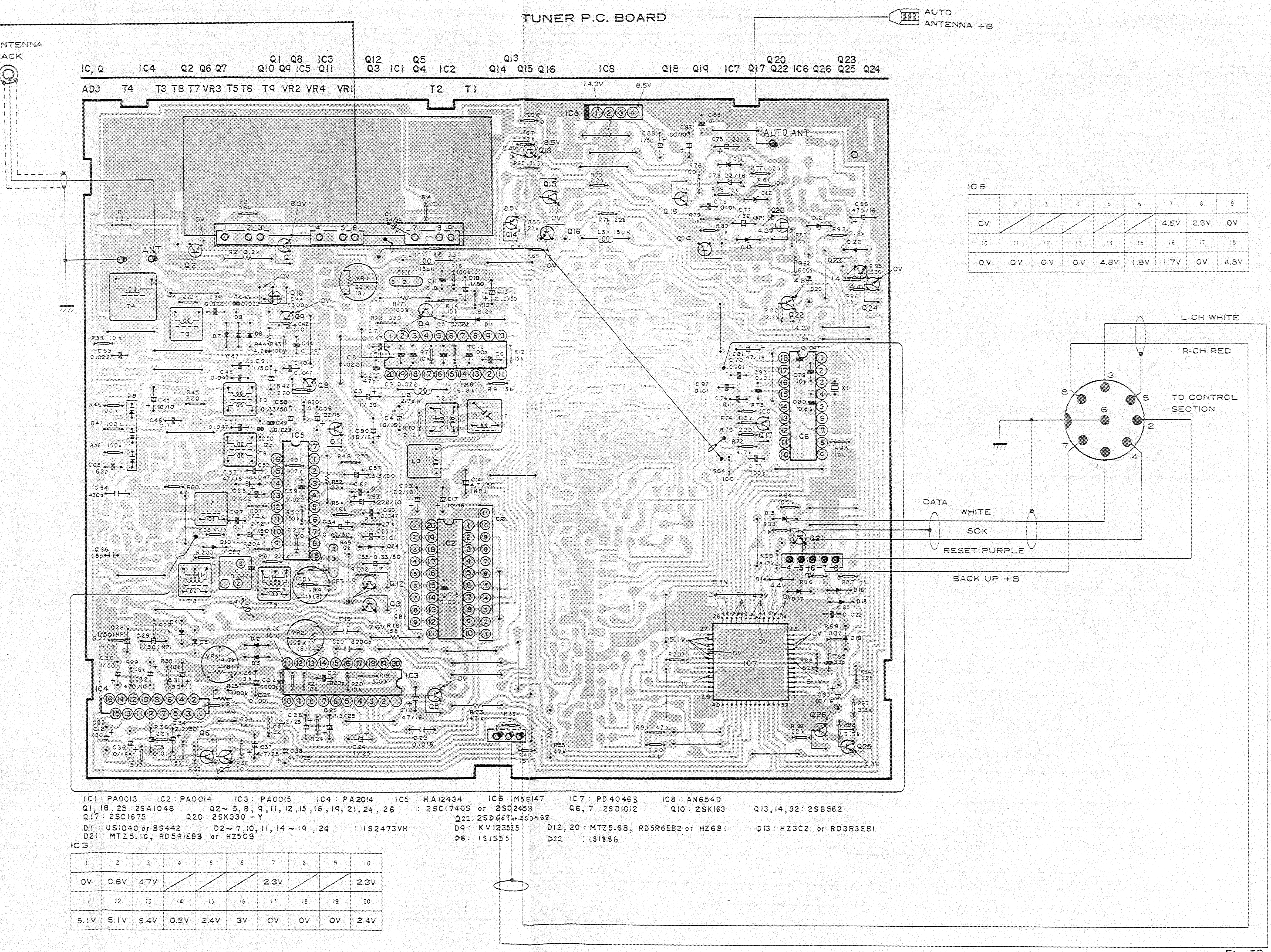
2	3	4	5	6	7	8	9	10
/	/	7.6V	2.3V	1.7V	1.6V	/	3.7V	0V
2	13	14	15	16	17	18	19	20
/	2.2V	7.4V	/	2.7V	/	0V	0V	/


Q2
IC2
Q3
L2
TC2
T2
L3
T1
IC2
CF1
IC1
D2
D3
L3
3
4 5 6
7 8 9

FRONT END(CWB-172)

3 IC2 : PA4009-A Q1 : P003 Q2 : 2SC2570
GR D1~3 : KVI310-6

Fig. 57


7
8
9
10
11
12
A
B
C
D
TUNER P.C. BOARD
ANTENNA JACK
AUTO ANTENNA +B
IC, Q
IC4
Q2 Q6 Q7
Q1 Q8 IC3
Q10 Q9 IC5 Q11
Q12 Q3
IC1
Q5 Q4
IC2
Q13 Q14 Q15 Q16
IC8
Q18 Q19
IC7
Q20 Q17 Q22
IC6
Q26
Q23 Q25
Q24
ADJ
T4
T3 T8 T7 VR3 T5 T6
T9 VR2 VR4 VR1
T2
T1
14.3V
8.5V
AUTO ANT
ANT
L-CH WHITE
R-CH RED
TO CONTROL SECTION
DATA
WHITE
SCK
RESET PURPLE
BACK UP +B

IC1 : PA0013   IC2 : PA0014   IC3 : PA0015   IC4 : PA2014   IC5 : HA12434   IC6 : MN6147   IC7 : PD4046B   IC8 : AN6540
Q1, 18, 25 : 2SA1048   Q2~5, 8, 9, 11, 12, 15, 16, 19, 21, 24, 26 : 2SC1740S or 2SC2458   Q6, 7 : 2SD1012   Q10 : 2SK163   Q13, 14, 32 : 2SB562
Q17 : 2SC1675   Q20 : 2SK330 - Y   Q22 : 2SD667 or 2SD468
D1 : US1040 or BS442   D2~7, 10, 11, 14~19, 24 : 1S2473VH   D9 : KV123525   D12, 20 : MTZ5.6B, RD5R6EB2 or HZ6B1   D13 : HZ3C2 or RD3R3EB1
D21 : MTZ5.1C, RD5R1EB3 or HZ5C3   D8 : 1S1555   D22 : 1S1886

IC3

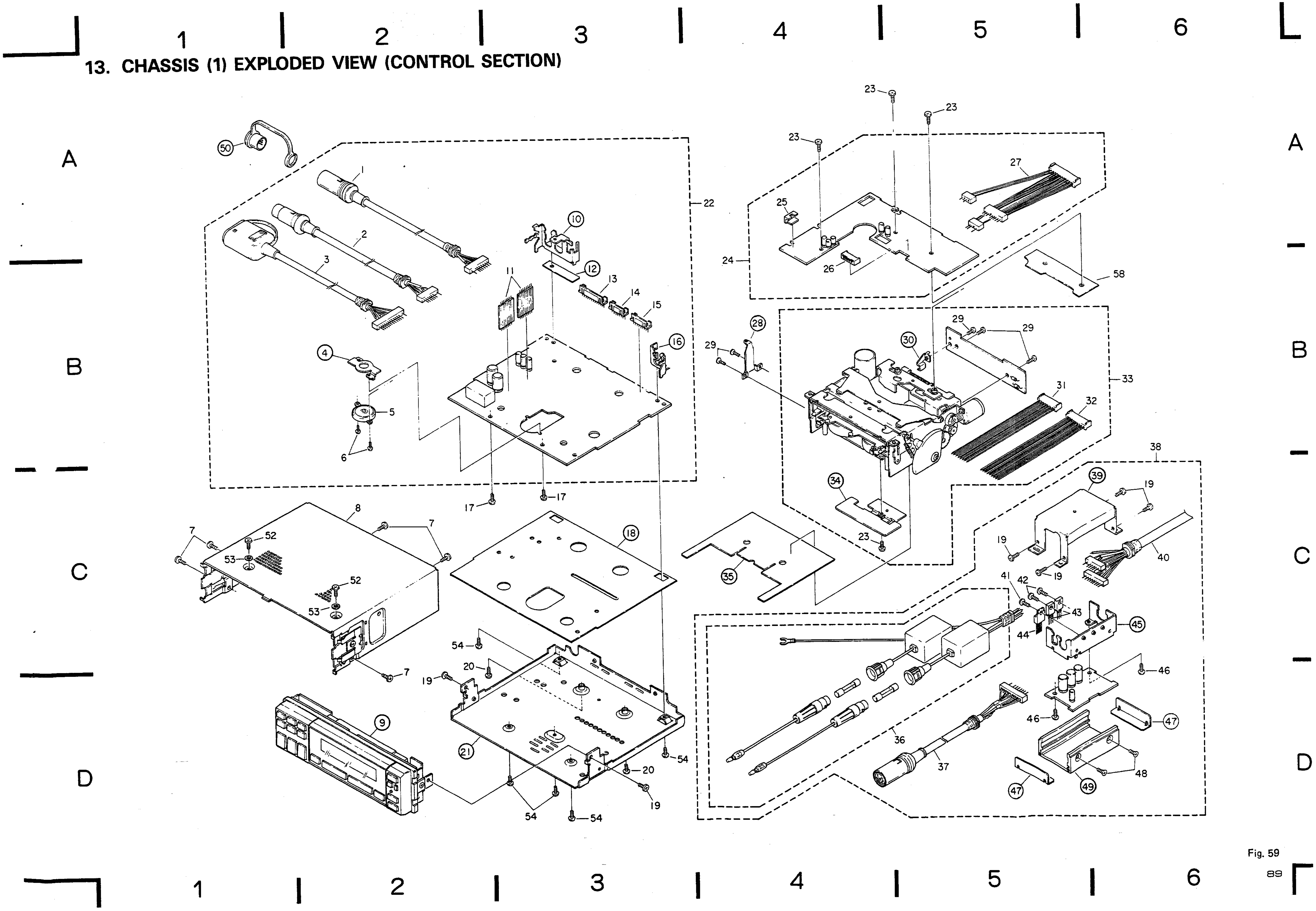
1	2	3	4	5	6	7	8	9	10
0V	0.6V	4.7V	/	/	/	2.3V	/	/	2.3V
11	12	13	14	15	16	17	18	19	20
5.1V	5.1V	8.4V	0.5V	2.4V	3V	0V	0V	0V	2.4V

IC6

1	2	3	4	5	6	7	8	9
0V	/	/	/	/	/	4.8V	2.9V	0V
10	11	12	13	14	15	16	17	18
0V	0V	0V	0V	4.8V	1.8V	1.7V	0V	4.8V

Fig. 58

13. CHASSIS (1) EXPLODED VIEW (CONTROL SECTION)



1
2
3
4
5
6
A
B
C
D
㊿
1
2
3
22
⑩
⑫
11
13
14
15
⑯
④
5
6
17
17
23
23
23
23
27
25
24
26
58
㉘
29
29
㉚
29
29
33
31
32
㉞
23
38
㊴
19
19
19
40
㉟
8
7
7
7
52
53
52
53
7
⑱
54
20
19
⑨
㉑
54
20
19
54
54
41
42
43
44
㊺
46
46
㊼
36
37
48
㊾
㊼

Fig. 59

Chassis (1)

- **Parts List**
- *For your Parts Stock Control, the fast moving items are indicated with the marks ★★ and ★.*
  ★★ : GENERALLY MOVES FASTER THAN ★.
  This classification shall be adjusted by each distributor because it depends on model number, temperature, humidity, etc.
- *Parts whose parts numbers are omitted are subject to being not supplied.*

Mark	No.	Part No.	Description
	1.	CDF-560	Connector
	2.	CDF-554	Connector
	3.	CDF-558	Connector
	4.		Holder
	5.	CPV-031	Buzzer
	6.	HBA-181	Screw
	7.	CBA-151	Screw
	8.	CXD-280	Case Unit
	9.		Grille Volume Unit
	10.		Holder
	11.	CDF-371	Connector
	12.		Insulator
	13.	CKS-278	Plug
	14.	CKS-273	Plug
	15.	CKS-274	Plug
	16.		Holder
	17.	BMZ26P040FMC	Screw
	18.		Insulator
	19.	BMZ26P050FMC	Screw
	20.	BMZ26P070FMC	Screw
	21.		Chassis
	22.	CWX-528	Control Unit
	23.	BMZ20P050FMC	Screw
	24.	CWK-320	Audio Unit
	25.	CKS-314	Plug
	26.	CKS-183	Connector
	27.	CDF-372	Connector
	28.		Bracket
	29.	BMZ20P030FMC	Screw
	30.		Cover
	31.	CDF-287	Connector (8P)
	32.	CDF-286	Connector (9P)
	33.	CXK-041	Cassette Mechanism Assy
	34.		Heat Sink
	35.		Insulator
	36.	CDF-376	Cord
	37.	CDF-402	Connector
	38.	CWX-450	Filter Assy
	39.		Case
	40.	CDF-561	Cord
	41.	BMZ30P050FMC	Screw
	42.	BMZ30P060FMC	Screw
★★	43.	2SA900	Transistor
★★	44.	PA3009	IC
	45.		Holder
	46.	CBA-124	Screw
	47.		Cover
	48.	CMZ30P080FMC	Screw
	49.		Heat Sink
	50.		Cap
	51.	VACANT	
	52.	BMZ23P050FZK	Screw
	53.	WB30FZK	Washer
	54.	BMZ26P050FMC	Screw
	55-57.	VACANT	
	58.		Insulator

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14. CHASSIS (2) EXPLODED VIEW (CONTROL SECTION)

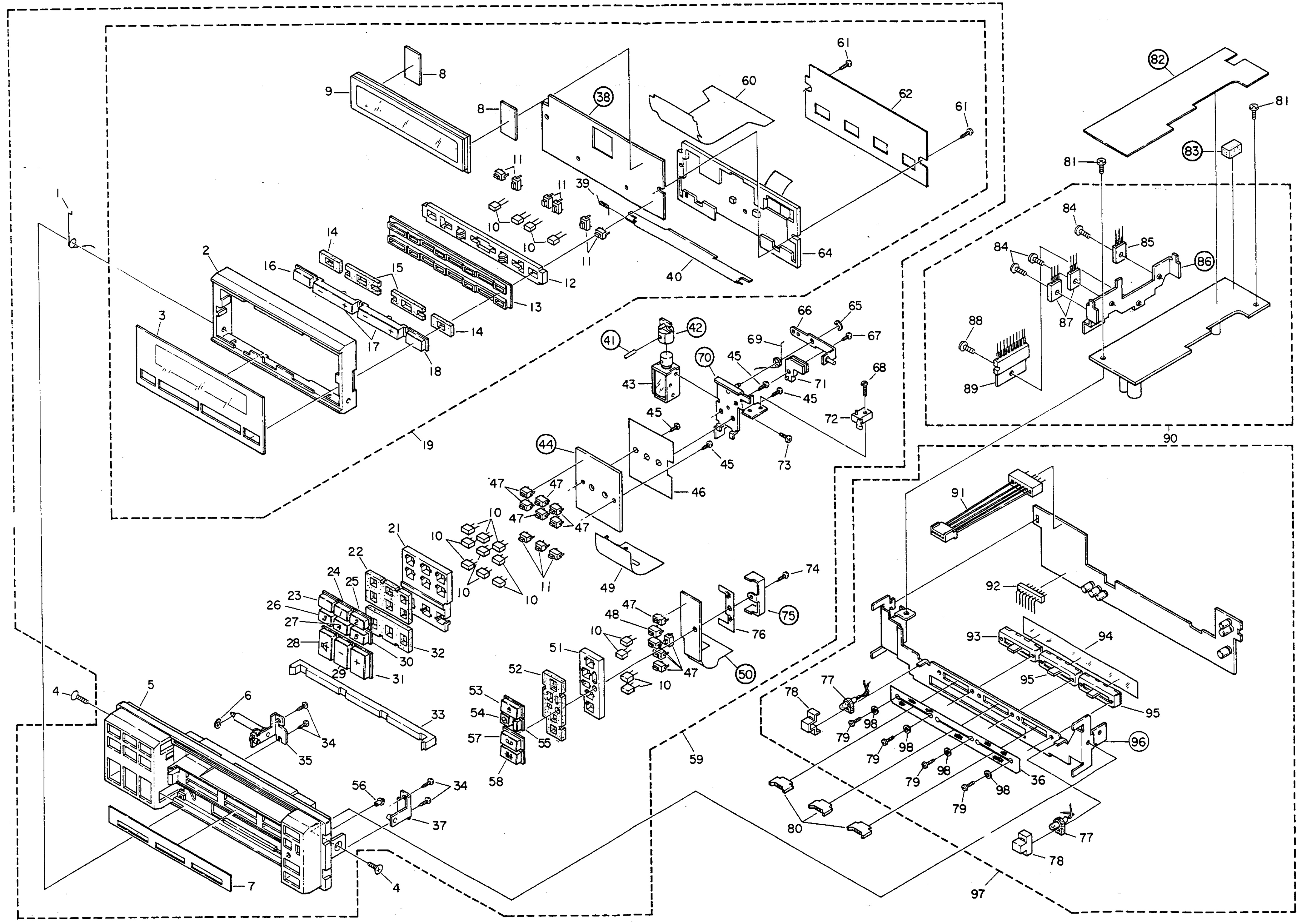
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Fig. 60

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Chassis (2)

• Parts List

Mark	No.	Part No.	Description
	1.	CBH-750	Spring
	2.	CNS-942	Grille
	3.	CNK-219	Plate
	4.	CMZ30P050FMC	Screw
	5.	CNK-139	Grille
	6.	YE20FUC	Washer
	7.	CNW-575	Plate
	8.	CNM-920	Cushion
	9.	CP5205GLR	Display
★	10.	BG5724K	LED
★★	11.	CSG-212	Switch
	12.	CNW-568	Holder
	13.	CWW-162	LED Array
	14.	CNM-924	Cushion
	15.	CNM-923	Cushion
★	16.	CAC-607	Button (Green)
★	17.	CAC-605	Button
★	18.	CAC-606	Button
	19.	CWS-211	Display Unit
	20.	VACANT	
	21.	CNW-570	Spacer
	22.	CNM-914	Cushion
★	23.	CAC-772	Button (0)
★	24.	CAC-773	Button (1)
★	25.	CAC-774	Button (2)
★	26.	CAC-775	Button (3)
★	27.	CAC-776	Button (4)
★	28.	CAC-611	Button (Attenuator)
★	29.	CAC-580	Button (—)
★	30.	CAC-777	Button (5)
★	31.	CAC-579	Button (+)
	32.	CNM-929	Cushion
	33.	CNW-569	Lens
	34.	CBA-126	Screw
	35.	CXC-928	Bearing Unit
	36.	CNM-930	Cover
	37.	CNF-849	Holder
	38.		P.C. Board
	39.	CBH-751	Spring
	40.	CAT-176	Door
	41.		Pin
	42.		Holder
★	43.	CXP-041	Solenoid (Door)
	44.		P.C. Board
	45.	BTZ20P080FMC	Screw
	46.	CNM-925	Insulator
★★	47.	CSG-211	Switch
★★	48.	CSG-212	Switch
	49.	CNL-356	P.C. Board
	50.		P.C. Board

Mark	No.	Part No.	Description
	51.	CNW-571	Spacer
	52.	CNM-913	Cushion
★	53.	CAC-577	Button (Open/Eject)
★	54.	CAC-588	Button (Clock)
★	55.	CAC-610	Button (Program Timer)
★	56.	CAC-615	Button (Cancel)
★	57.	CAC-608	Button (Tape)
★	58.	CAC-609	Button (Tuner)
	59.	CXD-291	Grille Unit
	60.	CNL-355	P.C. Board
	61.	PLZ20P080FNi	Screw
	62.	CAH-227	Plate
	63.	VACANT	
★★	64.	CWS-173	Switch Assy
	65.	YE15FUC	Washer
	66.	CNF-844	Lever
	67.	BMZ20P050FMC	Screw
	68.	HBA-171	Screw
	69.	CBH-749	Spring
	70.		Holder
	71.	CNW-574	Guide
★★	72.	CSN-078	Switch (Door)
	73.	BMZ20P025FMC	Screw
	74.	BTZ20P080FMC	Screw
	75.		Guide
	76.	CNM-927	Spacer
★★	77.	CEL-129	Lamp, 14V 40mA
	78.	CNW-573	Holder
	79.	BMZ20P030FMC	Screw
	80.	CXD-090	Knob Unit
	81.	BMZ26P050FMC	Screw
	82.		Insulator
	83.		Spacer
	84.	BMZ30P060FMC	Screw
★★	85.	2SA900	Transistor
	86.		Heat Sink
★★	87.	2SC1568	Transistor
	88.	BMZ30P040FMC	Screw
★★	89.	BA6209	IC
★	90.	CWX-499	Power Unit
	91.	CDF-373	Connector
	92.	CKS-179	Plug
★★	93.	CCS-331	Volume (Balance)
	94.	CNN-305	Insulator
★★	95.	CCS-332	Volume (Bass, Treble)
	96.		Frame Unit
	97.	CWG-142	Volume Unit
	98.	HBF-120	Washer

15. CASSETTE MECHANISM EXPLODED VIEW (CONTROL SECTION)

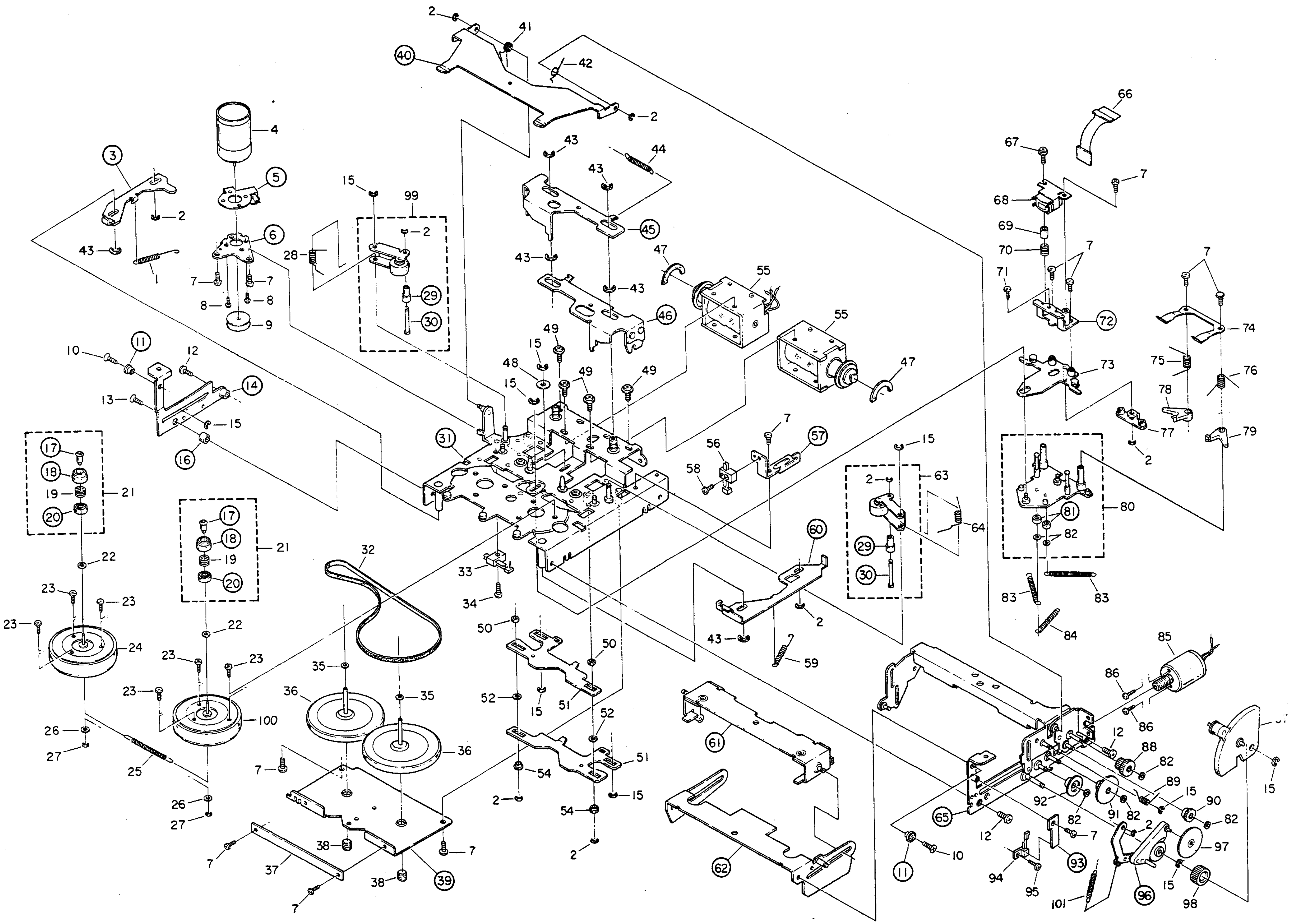
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Fig. 61

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Cassette Mechanism

- **Parts List**

Mark	No.	Part No.	Description
	1.	CBH-593	Spring
	2.	YE15FUC	Washer
	3.		Slide Plate
★★	4.	CXM-069	Motor (Capstan)
	5.		Cover
	6.		Bracket
	7.	BMZ20P030FMC	Screw
	8.	CBA-098	Screw
	9.	CLB-430	Pulley
	10.	CMZ20P040FMC	Screw
	11.		Bush
	12.	BMZ26P050FMC	Screw
	13.	CMZ26P030FMC	Screw
	14.		Bracket Unit
	15.	YE20FUC	
	16.		Bush
	17.		Reel
	18.		Collar
	19.	CBH-653	Spring
	20.		Bush
★★	21.	CXC-829	Reel Unit
	22.	CBF-136	Washer
	23.	CBA-132	Screw
★★	24.	CXM-403	Reel Motor
	25.	CBH-654	Spring
	26.	WA17D032D050	Washer
	27.	YE12FUC	Washer
	28.	CBH-598	Spring
	29.		Roller
	30.		Shaft
	31.		Chassis Unit
★★	32.	CNT-099	Belt
★★	33.	CSN-068	Switch (CST SET)
	34.	BMZ20P080FMC	Screw
	35.	WA21D040D025	Washer
	36.	CNR-165	Flywheel
	37.	CNL-291	P.C. Board
	38.	CNV-984	Screw
	39.		Plate
	40.		Arm
	41.	CBH-716	Spring
	42.	CBH-748	Spring
	43.	YE30FUC	Washer
	44.	CBH-594	Spring
	45.		Slide Plate Unit
	46.		Slide Plate Unit
	47.	CNM-672	Spacer
	48.	WC26FMC	Washer
	49.	PMS26P030FUC	Screw
	50.	CLB-039	Roller

Mark	No.	Part No.	Description
	51.	CNE-888	Cam
	52.	WA26D047D025	Washer
	53.	VACANT	
	54.	CLB-038	Roller
★	55.	CXP-038	Solenoid
★★	56.	CSN-075	Switch (CrO_2)
	57.		Bracket
	58.	BMZ20P060FMC	Screw
	59.	CBH-728	Spring
	60.		Slide Plate
	61.		Holder Unit
	62.		Arm Unit
★★	63.	CXC-285	Pinch Holder Unit
	64.	CBH-597	Spring
	65.		Side Frame Unit
	66.	CNL-195	P.C. Board
	67.	PMS20G060FMC	Screw
★★	68.	CPB-352	Head
	69.	CNV-301	Rubber
	70.	CBH-198	Spring
	71.	BMZ20P040FMC	Screw
	72.	CXC-625	Head Base Unit
	73.	CXC-194	Slide Plate Unit
	74.	CNE-921	Spring
	75.	CBH-600	Spring
	76.	CBH-599	Spring
	77.	CXC-196	Cam Unit
	78.	CNW-174	Arm
	79.	CNW-175	Arm
	80.	CXC-195	Slide Plate Unit
	81.		Roller
	82.	CBF-045	Washer
	83.	CBH-596	Spring
	84.	CBH-595	Spring
★★	85.	CXC-814	Motor Unit (Loading)
	86.	CBA-108	Screw
	87.	CXC-961	Gear Unit
	88.	CNW-578	Gear
	89.	CBH-759	Spring
	90.	CNW-579	Gear
	91.	CNW-448	Gear
	92.	CNW-449	Gear
	93.		P.C. Board
★★	94.	HSN-135	Switch (CST IN)
	95.	BMZ17P030FMC	Screw
	96.		Arm Unit
	97.	CNW-452	Gear
	98.	CNW-453	Gear
★★	99.	CXC-198	Pinch Holder Unit
★★	100.	CXM-404	Reel Motor
	101.	CBH-777	Spring

16. TUNER EXPLODED VIEW (TUNER SECTION)

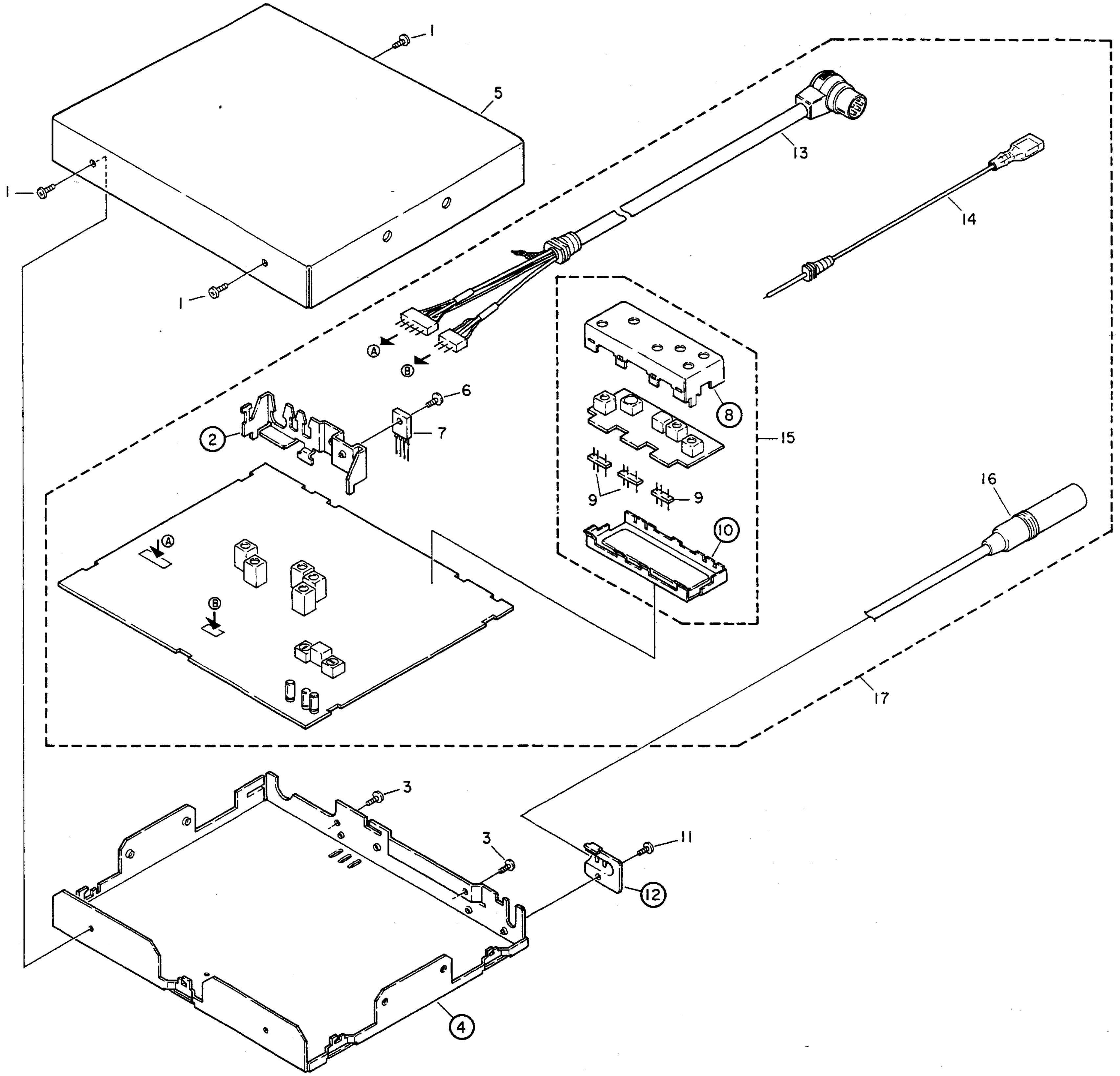
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Fig. 62

Tuner Assy

- **Parts List**

Mark	No.	Part No.	Description
	1.	CBA-142	Screw
	2.		Holder
	3.	BMZ26P040FMC	Screw
	4.		Chassis
	5.	CNB-806	Case
	6.	BMZ30P060FMC	Screw
★★	7.	AN6540	IC
	8.		Case
	9.	CKS-092	Plug
	10.		Case
	11.	BMZ30P040FMC	Screw
	12.		Clamper
	13.	CDF-884	Connector
	14.	CDF-885	Cord
	15.	CWB-172	FM Front End
	16.	CDH-069	Antenna Cable
	17.	CWE-636	Tuner Unit

17. ELECTRICAL PARTS LIST

NOTE:

When ordering resistors, first convert resistance values into code form as shown in the following examples.

Ex. 1 When there are 2 effective digits (any digit apart from 0), such as 560 ohm and 47k ohm (tolerance is shown by J = 5%, and K = 10%).

560Ω 56 × 10^1 561 .... RD1/4PS $\boxed{5}\boxed{6}\boxed{1}$ J
47kΩ 47 × 10^3 473 .... RD1/4PS $\boxed{4}\boxed{7}\boxed{3}$ J
0.5Ω 0R5 .... RN2H $\boxed{0}\boxed{R}\boxed{5}$ K
1Ω 010 .... RS1P $\boxed{0}\boxed{1}\boxed{0}$ K

Ex. 2 When there are 3 effeictive digits (such as in high precision metal film resistors).

5.62kΩ 562 × 10^1 .... RN1/4SR $\boxed{5}\boxed{6}\boxed{2}\boxed{1}$ F

- *For your parts Stock Control, the fast moving items are indicated with the marks ★★ and ★.*
  ★★: GENERALLY MOVES FASTER THAN ★.
  This classification shall be adjusted by each distributor because it depends on model number, temperature, humidity, etc.
- *Parts whose parts numbers are omitted are subject to being not supplied.*

Audio Unit (CWK-320)

MISCELLANEOUS

Mark	Symbol & Description		Part No.
★★	IC1		TA7705P
★★	IC2, IC3		PA3017
★★	IC4		HA17358
★★	Q1	Chip Transistor	2SB779-R or 2SB779-S
★★	Q2, Q4 – Q7	Chip Transistor	2SC2712-LG or 2SC2712-LL or 2SD601-YR or 2SD601-YS
★★	Q3	Chip Transistor	2SB709-AP or 2SB709-AQ or 2SB709-AR or 2SA1179-M5 or 2SA1179-M6 or 2SA1179-M7
★	D1, D7, D8		US1040 or 1S1555 or 1S2076
★	D2	Chip Diode	MA151WA
★	D3, D5, D6	Chip Diode	MA151WK
★	D9		RD4R3EB3
	L1, L2	Coil	CTH-077
★★	VR1, VR2	Semi-fixed, 330Ω (B)	CCP-171
★★	VR3	Semi-fixed, 68kΩ (B)	CCP-185

RESISTORS

Mark	Symbol & Description	Part No.
	R1 – R58, R61 – R82, R85 – R105, R107 – R111 Chip Resistor	RS1/8S □□□J
	R59, R60, R83, R84, R106	RD1/6PS □□□J

CAPACITORS

Mark	Symbol & Description		Part No.
	C1 – C4	Chip Capacitor	CKSYB681K50
	C5, C6		CQMA123J50L
	C7, C8, C77		CEA220M16LS
	C9, C15, C16, C37, C38, C49, C50, C74		CEA100M16LS
	C10, C13, C14, C43 – C46, C71		CEA4R7M16LS
	C11, C12, C72, C73		CEA330M10LS
	C17 – C26		CEA101M10L2
	C27, C28		CQMA182J50L
	C29, C30, C33, C34		CQMA153J50L
	C31, C32, C61 – C64		CEAR47M50LS
	C35, C36		CQMA103J50L
	C39, C40, C51 – C54		CEAR15M50LS
	C41, C42		CQMA823J50L
	C47, C48		CQMA183J50L
	C55, C56		CQMA392J50L
	C57, C58		CQMA332J50L
	C59, C60, C85, C86	Chip Capacitor	CKSYB102K50
	C65, C66		CQMA562J50L
	C67, C68	Chip Capacitor	CCSCH390J50
	C69, C70		CEA220M6R3LS
	C75, C76		CEA010M50LS
	C78		CEA470M6R3LS
	C79, C80		CEA010M50NP
	C87, C88		CEA2R2M35LS

Tuner P.C. Board

MISCELLANEOUS

Mark	Symbol & Description		Part No.
★★	IC1		PA0013
★★	IC2		PA0014
★★	IC3		PA0015
★★	IC4		PA2014
★★	IC5		HA12434
★★	IC6		MN6147
★★	IC7		PD4046B
★★	IC8		AN6540
★★	Q1, Q18, Q25		2SA1048
★★	Q2 – Q5, Q8, Q9, Q11, Q12, Q15,		2SC1740S or
★★	Q16, Q19, Q21, Q24, Q26		2SC2458
★★	Q6, Q7		2SD1012
★★	Q10		2SK163
★★	Q13, Q14		2SB562
★★	Q17		2SC1675
★★	Q20		2SK330-Y
★★	Q22		2SD468 or 2SD667
★★	Q23		2SB772
★	D1		US1040 or BS442
★	D2 – D7, D10, D11, D14 – D19, D24		1S2473VH
★	D8		1S1555
★	D9		KV1235Z5 or KV1235Z3
★	D12, D20		MTZ5.6B or RD5R6EB2 or HZ6B1
★	D13		HZ3C2 or RD3R3EB1
★	D21		MTZ5.1C or RD5R1EB3 or HZ5C3
★	D22		1S1886
	L1, L5	Ferri-Inductor	CTF-156
	L2	Ferri-Inductor	CTF-155
	L3	Coil	CTC-144
	L4	Ferri-Inductor	CTF-157
	T1	Coil	CTC-193
	T2	Coil	CTC-194
	T3	Coil	CTB-149
	T4	Coil	CTB-161
	T5, T6	Coil	CTB-150
	T7	Coil	CTB-164
	T8	Coil	CTE-139

Mark	Symbol & Description	Part No.
	T9 Coil	CTE-140
	CF1 Ceramic Filter	CTF-182
	CF2 Filter	CTF-100
	CF3 Filter	CTF-165
	CR1	CWW-183
	CR2	CWW-182
★★	VR1 Semi-fixed, 22kΩ (B)	CCP-247
★★	VR2 Semi-fixed, 1.5kΩ (B)	CCP-240
★★	VR3 Semi-fixed, 4.7kΩ (B)	CCP-243
★★	VR4 Semi-fixed, 1kΩ (B)	CCP-239
	X1 X'tal	CSS-034

RESISTORS

Mark	Symbol & Description	Part No.
	R1, R3, R4, R6 – R16, R19 – R22, R24, R26 – R43, R45 – R51, R53, R54, R56 – R99, R201 – R207, Chip Resistor	RS1/8S □□□J
	R2, R17, R18, R23, R52, R55	RD1/4PM □□□J
	R44	RD1/4VM □□□J

CAPACITORS

Mark	Symbol & Description	Part No.
	C1	CSYA0R1M25SAN
	C2, C65 Chip Capacitor	CCSCH470J50
	C3, C10, C30, C31, C72, C88, C91	CEA010M50L2
	C4, C17, C36, C83, C90	CEA100M16L2
	C5, C6, C8, C9, C39, C43, C49, C59, C68, C69 Chip Capacitor	CKSYB223K25
	C7, C40, C41, C48, C51, C52, C60, C71, C84 Chip Capacitor	CKSYF473Z50
	C11, C42, C61, C70, C78, C92, C93 Chip Capacitor	CKSYB103K50
	C12, C73 Chip Capacitor	CCSSL101J50
	C13, C33, C34	CEA2R2M50L2
	C14	CEA4R7M50NPLL
	C15, C56, C75, C76	CEA220M16L2
	C16 Chip Capacitor	CKSYB102K50
	C18, C53, C81	CEA470M16L2
	C19, C35	CQMA103J50L
	C20	CQMA822J50L
	C21, C22 Chip Capacitor	CKSYB682K50
	C23	CQMA183J50L
	C24	CSZA010K25
	C25	CSZA1R5M25
	C26	CSZA2R2M25
	C27	CQSAH102J50
	C28, C29, C77	CEA010M50NPLL
	C32	CEA471M10L2
	C37, C38	CEA4R7M25L2
	C44	CKSYB332K50
	C45	CSZA100M10
	C46, C62, C67, C74, C89 Chip Capacitor	CKSYF104Z25
	C47 Chip Capacitor	CCSSH120J50

Mark	Symbol & Description	Part No.
	C50 Chip Capacitor	CCSCH180J50
	C54	CEAR47M50L2
	C55, C58	CEAR33M50L2
	C57	CEA3R3M50LS
	C63	CEA221M10L2
	C64	CQPA431G100
	C66	CCDVK180J50L
	C79, C80	CCSCH100D50
	C82 Chip Capacitor	CCSCH330J50
	C85 Chip Capacitor	CKSYB223K25
	C86	CEA471M16L2
	C87	CEA101M10L2

FM Front End (CWB-172)

MISCELLANEOUS

Mark	Symbol & Descrition	Part No.
★★	IC1	CWW-173
★★	IC2	PA4009
★★	*Q1	P003
★★	Q2	2SC2570
★★	Q3	2SK241-GR
★	D1 – D3	KV1310-6
	L1 Coil	CTC-189
	L2 Coil	CTC-190
	L3 Coil	CTC-191
	L4 Chip Inductor	CTF-185
	L5 Chip Inductor	CTF-186
	T1 Transformer	CTC-186
	T2 IF Transformter	CTC-187
	TC1, TC2 Trimmer	CCG-098
	CF1, CF2 Ceramic Filter	CTF-182

RESISTORS

Mark	Symbol & Description	Part No.
	R1, R2, R4 – R11, R14 Chip Resistor	RS1/8S □□□K
	*R3, R12, R13	RD1/6PS □□□J

Caution:
Transistor *Q1 and resistor *R3 used mutually in the following assembly.

Q1	R3
P003-A	RD1/6PS473J
P003-B	RD1/6PS393J

CAPACITORS

Mark	Symbol & Description	Part No.
	C1, C2 Chip Capacitor	CCSSH220J50
	C3, C8 Chip Capacitor	CCSCH050C50
	C4, C5, C11, C15, C20 Chip Capacitor	CKSYB222K50
	C6 Chip Capacitor	CCSCH040C50
	C7, C10 Chip Capacitor	CKSYB103K50
	C9 Chip Capacitor	CCSSH560J50
	C12, C18 Chip Capacitor	CCSTH150J50
	C13 Chip Capacitor	CCSTH330J50
	C14 Chip Capacitor	CCSTH120J50
	C16, C19, C21 Chip Capacitor	CKSYF223Z50
	C17 Chip Capacitor	CCSUJ080D50
	C22	CEA2R2M35LS
	C23	CEA3R3M25LS

Filter Assy (CWX-450)

Mark	Symbol & Description	Part No.
★★	IC1	PA3009
★★	Q1, Q2	2SA900
	R1	RN1/2PR22J
	R2, R3	RD1/4PM562J
	C1, C2	CEA010M50L2
	C3 – C5	CEA471M16L2
	C6, C7	CQMA473K50L

Display Unit (CWS-211)

Mark	Symbol & Description	Part No.
★★	IC1	PD7005
★★	Q1, Q2 Chip Transistor	2SC2712-LG or 2SC2712-LL or 2SC2712-LY or 2SD601-YQ or 2SD601-YR or 2SD601-YS
★	D1 Chip Diode	MA151WA
★	D2 Chip Diode	MA151A
★	LD10 – LD13 LED	BG5724K
★★	S10 – S15 Switch	CSG-212
★★	S16 Switch Assy	CWS-173
★	LED Array	CWW-162
	Display	CP5205GLR
	R1 – R18 Chip Resistor	RS1/8S □□□J
	C1 Chip Capacitor	CCSCH101J50

Power Unit (CWX-499)

MISCELLANEOUS

Mark	Symbol & Description	Part No.
★★	IC1	PA0002A
★★	IC2	BA6209
★★	Q1	2SA900
★★	Q2	2SC2021F
★★	Q3	2SC3113
★★	Q4	2SC2634NC
★★	Q5, Q6	2SC1568
★	D1, D4, D6, D7	1S2473VH
★	D2	RD8R2EB2
★	D3	HZ7B2 or RD7R5EB1
★	D5	RD4R7JB3
★	D8	S5566 or 1S1886
★	D9	HZ11B1
★★	VR1 Semi-fixed, 68kΩ (B)	CCP-212

RESISTORS

Mark	Symbol & Description	Part No.
	R1 – R14, R16 – R23 Chip Resistor	RS1/8S □□□J
	R15	RN1P4R7JL

CAPACITORS

Mark	Symbol & Description	Part No.
	C1, C9 Chip Capacitor	CKSYB102K50
	C2	CEA2R2M50L2
	C3, C4	CKDBC563K25
	C5 8200pF	CCE-020
	C6	CEA2R2M50LL
	C7	CEA010M50LS2
	C8	CKDBC473K25
	C10	CKDBC223K25
	C11	CEA3R3M50L2
	C12, C13	CKSYB103K50
	C14	CEA100M16L2
	C15, C20	CEA101M10L2
	C16, C21	CEA221M10L2
	C17	CEA221M10L2
	C18	CEA471M16L2
	C19	CEA101M6R3L2
	C22	CEA470M10L2

Head P.C. Board

Mark	Symbol & Description	Part No.
★★	HD1 Head	CPB-352

Reel P.C. Board

Mark	Symbol & Description	Part No.
	C1, C2	CKPYD102M50

P.C. Board

Mark	Symbol & Description	Part No.
★★	Q1	2SA1048
★	D1, D2	DS135
	C3 – C5	CKPYX103M25

Volume Unit (CWG-142)

MISCELLANEOUS

Mark	Symbol & Description		Part No.
★★	IC1		PA0005A
★★	IC2		TA75558P
★★	Q1		2SA937F
★★	Q2, Q3		2SC2021F
★	D1		RD6R8JB3
★	D2		US1040 or 1S1555 or 1S2076
★	D3		1S1886 or SIB01-01 or SIB01-02
★★	VR1, VR2	Volume, 25kΩ (B) (TREBLE, BASS)	CCS-332
★★	VR3	Volume, 50kΩ (W) (BALANCE)	CCS-331
★★	IL1, IL2	Lamp, 14V 40 mA	CEL-129

RESISTORS

Mark	Symbol & Description	Part No.
	R1 – R19, R21	RD1/6VS □□□J

CAPACITORS

Mark	Symbol & Description	Part No.
	C3, C4, C13 – C15, C22, C23	CEA100M16LS
	C5, C6	CEAR22M50LS
	C7, C8	CCDSL470L50L
	C9 – C12, C24 – C26	CEA330M10LS
	C16, C17	CQMA682J50L
	C18, C19	CQMA473J50L
	C20, C21	CCDSL330J50L
	C27	CKDYB102K50L
	C28	CEA220M6R3LS

Switch Unit (A)

Mark	Symbol & Description		Part No.
★	LD1 – LD9	LED	BG5724K
★★	S1 – S6	Switch (0 – 5)	CSG-211
★★	S7 – S9	Switch (ATT, DOWN, UP)	CSG-212

Switch Unit (B)

Mark	Symbol & Description		Part No.
★	LD26 – LD29	LED	BG5724K
★★	S20, S21, S23 – S25	Switch	CSG-211
★★	S22	Switch (CLOCK)	CSG-212

Miscellaneous Parts List

Mark	Symbol & Description		Part No.
★★	S1	Switch (METAL)	CSN-075
★★	S2	Switch (CST IN)	HSN-135
★★	S3	Switch (CST SET)	CSN-068
★★	S26	Switch (Door)	CSN-078
★★	M1	Motor Unit (Loading)	CXC-814
★★	M2	Motor (Capstan)	CXM-069
★★	M3	Motor (Reverse Reel)	CXM-404
★★	M4	Motor (Forward Reel)	CXM-403
★	SO1, SO2	Solenoid	CXP-038
★	SO3	Solenoid (Door)	CXP-041

18. PACKING METHOD

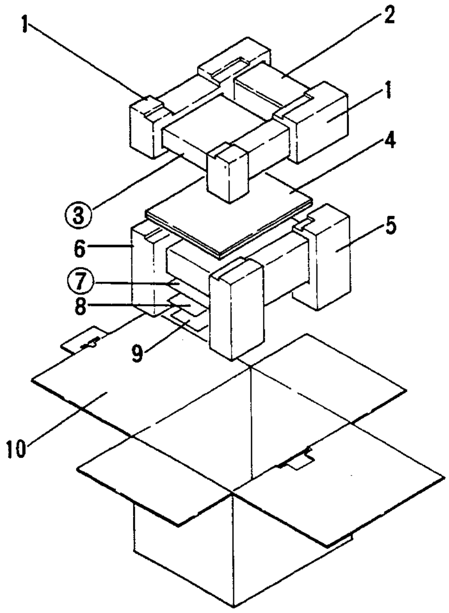


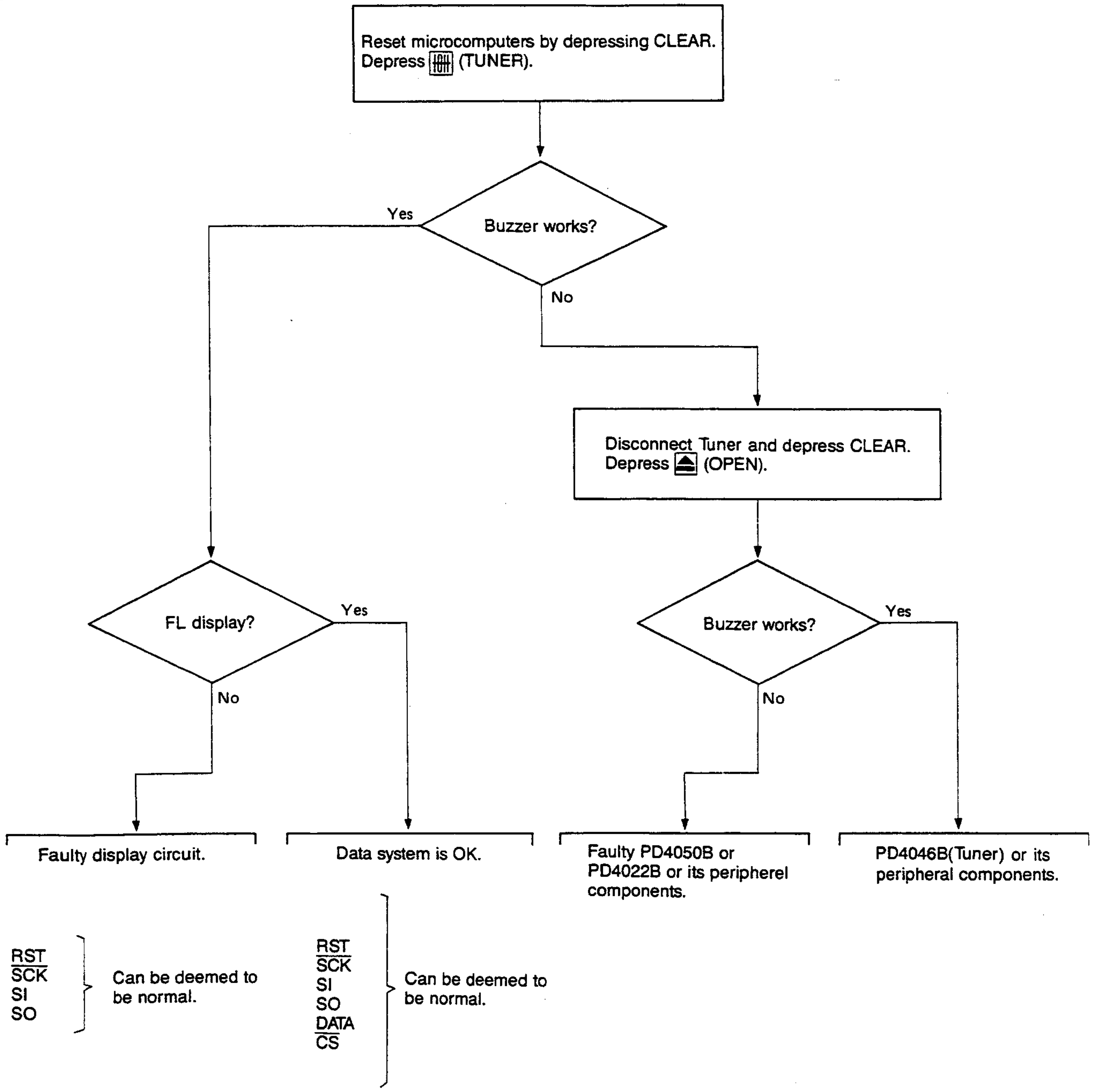
Fig. 63

- **Parts List**
- *For your parts Stock Control, the fast moving items are indicated with the marks ★ ★ and ★.*
  ★ ★: GENERALLY MOVES FASTER THAN ★
  This classification shall be adjusted by each distributor because it depends on model number, temperature, humidity, etc.
- *Parts whose parts numbers are omitted are subject to being not supplied.*

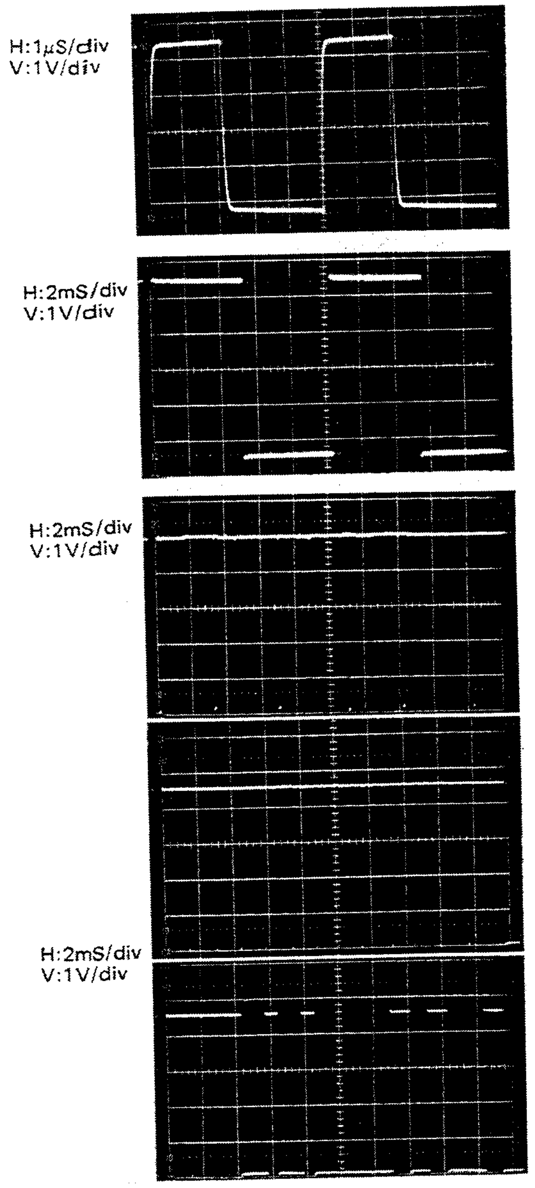
Mark	No.	Part No.	Description
	1.	CHD-580	Styrofoam
	2.	CNG-223	Holder
	3.		Tuner Assy
	4.	CRD-471	Owner's Manual (English)
	5.	CHD-030	Styrofoam
	6.	CHC-899	Styrofoam
	7.		Board
	8.	CNB-793	Panel
		CNW-757	Holder
	9.	CEA-954	Accessory Kit
	9-1.	CDE-437	Cord
	9-2.	CDH-048	Antenna Cable
	9-3.	CNF-111	Strap
	9-4.	CNF-382	Lever
	9-5.	CNM-667	Fastener
	9-6.	CNW-642	Holder
	9-7.	CEA-871	Screw Kit
	9-7-1.	CBA-028	Screw for Strap
	9-7-2.	CBA-101	Screw
	9-7-3.	CBA-102	Screw
	9-7-4.	NF40FMC	Nut
	9-7-5.	NF50FMC	Nut
	9-7-6.	WS40FMC	Washer
	10.	CHD-564	Carton

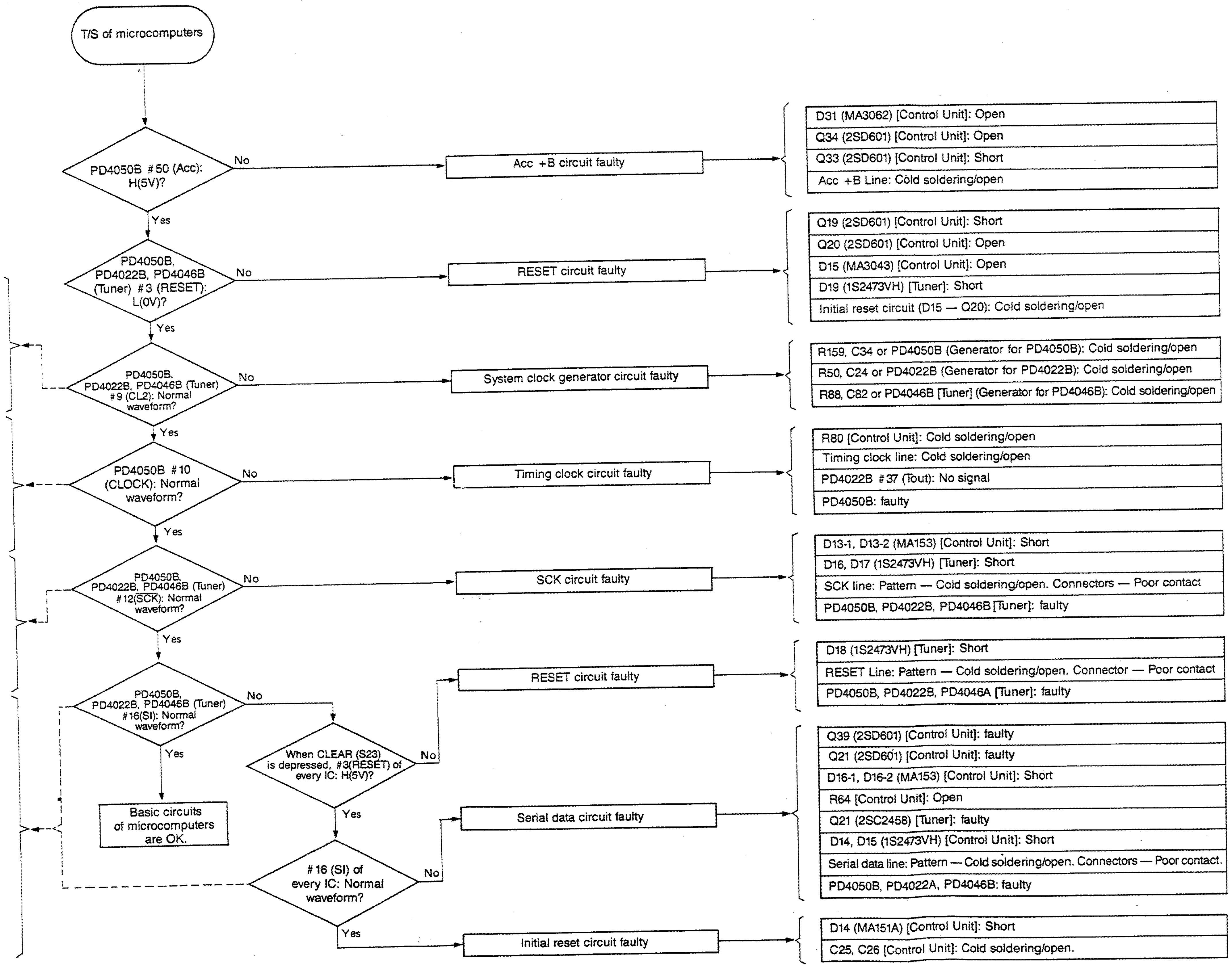
19. TROUBLESHOOTING

First see if the data communication system is faulty.


Reset microcomputers by depressing CLEAR.
Depress (TUNER).
Buzzer works?
Yes
No
Disconnect Tuner and depress CLEAR.
Depress (OPEN).
FL display?
Yes
No
Buzzer works?
Yes
No
Faulty display circuit.
Data system is OK.
Faulty PD4050B or PD4022B or its peripherel components.
PD4046B(Tuner) or its peripheral components.
RST
$\overline{SCK}$
SI
SO
Can be deemed to be normal.
RST
$\overline{SCK}$
SI
SO
$\overline{DATA}$
$\overline{CS}$
Can be deemed to be normal.

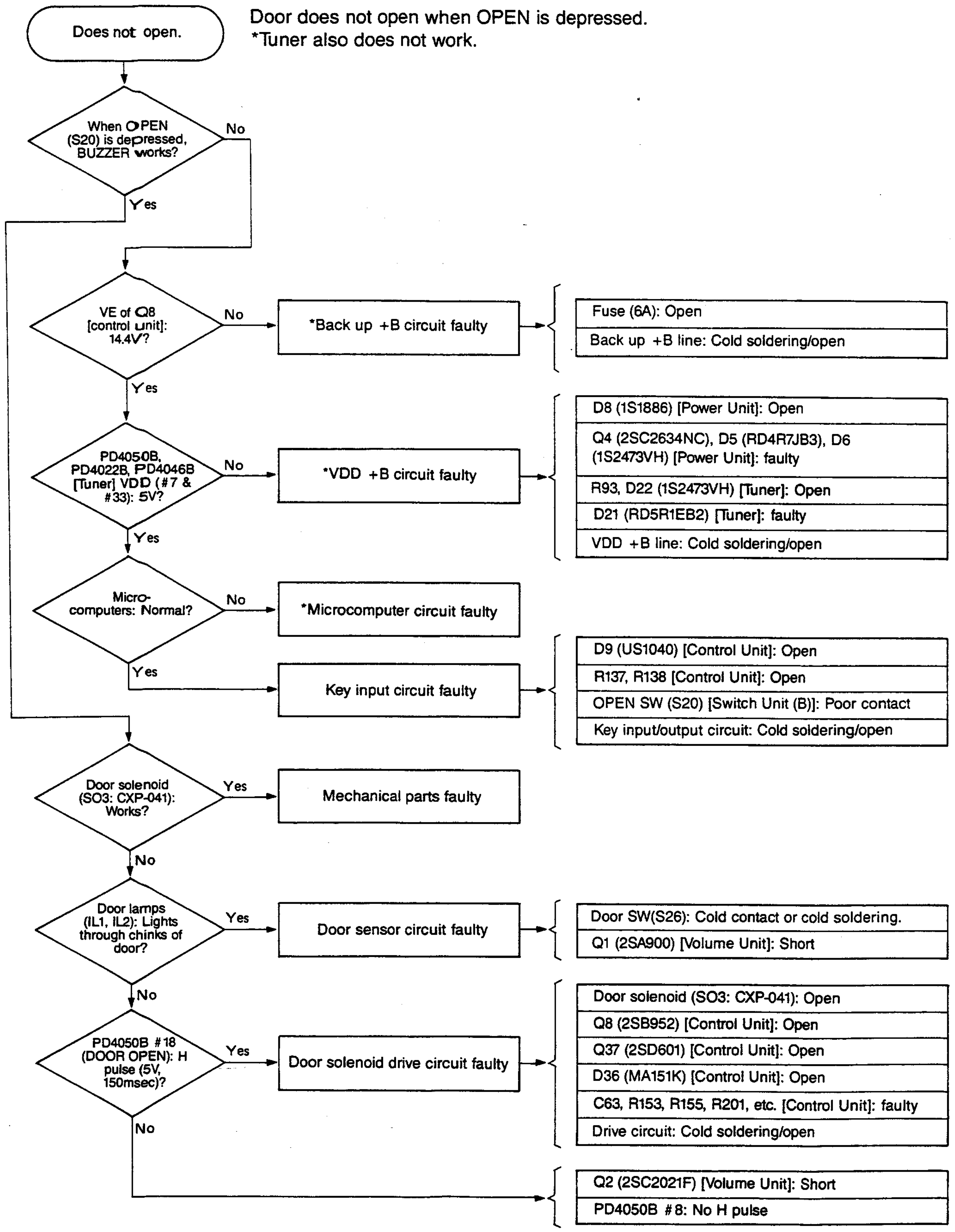
19.1 TROUBLESHOOTING MICROCOMPUTERS.




T/S of microcomputers
PD4050B #50 (Acc): H(5V)?
No
Acc +B circuit faulty
D31 (MA3062) [Control Unit]: Open
Q34 (2SD601) [Control Unit]: Open
Q33 (2SD601) [Control Unit]: Short
Acc +B Line: Cold soldering/open
Yes
PD4050B, PD4022B, PD4046B (Tuner) #3 (RESET): L(0V)?
No
RESET circuit faulty
Q19 (2SD601) [Control Unit]: Short
Q20 (2SD601) [Control Unit]: Open
D15 (MA3043) [Control Unit]: Open
D19 (1S2473VH) [Tuner]: Short
Initial reset circuit (D15 — Q20): Cold soldering/open
Yes
PD4050B, PD4022B, PD4046B (Tuner) #9 (CL2): Normal waveform?
No
System clock generator circuit faulty
R159, C34 or PD4050B (Generator for PD4050B): Cold soldering/open
R50, C24 or PD4022B (Generator for PD4022B): Cold soldering/open
R88, C82 or PD4046B [Tuner] (Generator for PD4046B): Cold soldering/open
Yes
PD4050B #10 (CLOCK): Normal waveform?
No
Timing clock circuit faulty
R80 [Control Unit]: Cold soldering/open
Timing clock line: Cold soldering/open
PD4022B #37 (Tout): No signal
PD4050B: faulty
Yes
PD4050B, PD4022B, PD4046B (Tuner) #12(SCK): Normal waveform?
No
SCK circuit faulty
D13-1, D13-2 (MA153) [Control Unit]: Short
D16, D17 (1S2473VH) [Tuner]: Short
SCK line: Pattern — Cold soldering/open. Connectors — Poor contact
PD4050B, PD4022B, PD4046B [Tuner]: faulty
Yes
PD4050B, PD4022B, PD4046B (Tuner) #16(SI): Normal waveform?
No
When CLEAR (S23) is depressed, #3(RESET) of every IC: H(5V)?
No
RESET circuit faulty
D18 (1S2473VH) [Tuner]: Short
RESET Line: Pattern — Cold soldering/open. Connector — Poor contact
PD4050B, PD4022B, PD4046A [Tuner]: faulty
Yes
Basic circuits of microcomputers are OK.
Yes
#16 (SI) of every IC: Normal waveform?
No
Serial data circuit faulty
Q39 (2SD601) [Control Unit]: faulty
Q21 (2SD601) [Control Unit]: faulty
D16-1, D16-2 (MA153) [Control Unit]: Short
R64 [Control Unit]: Open
Q21 (2SC2458) [Tuner]: faulty
D14, D15 (1S2473VH) [Control Unit]: Short
Serial data line: Pattern — Cold soldering/open. Connectors — Poor contact.
PD4050B, PD4022A, PD4046B: faulty
Yes
Initial reset circuit faulty
D14 (MA151A) [Control Unit]: Short
C25, C26 [Control Unit]: Cold soldering/open.

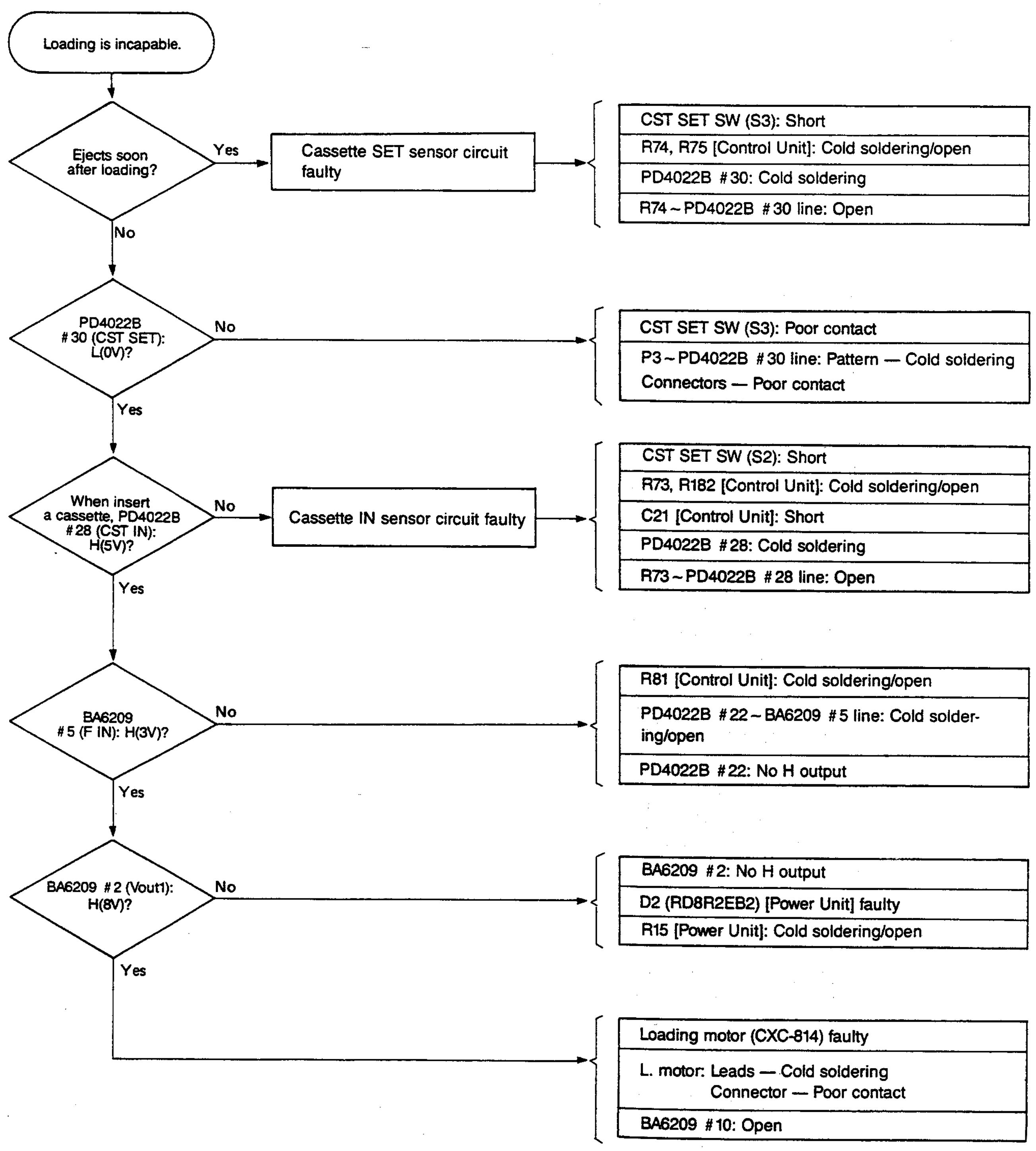
19.2 DOOR DOES NOT OPEN

Door does not open when OPEN is depressed.
*Tuner also does not work.


Does not open.
When OPEN (S20) is depressed, BUZZER works?
No
Yes
VE of Q8 [control unit]: 14.4V?
No
*Back up +B circuit faulty
Fuse (6A): Open
Back up +B line: Cold soldering/open
Yes
PD4050B, PD4022B, PD4046B [Tuner] VDD (#7 & #33): 5V?
No
*VDD +B circuit faulty
D8 (1S1886) [Power Unit]: Open
Q4 (2SC2634NC), D5 (RD4R7JB3), D6 (1S2473VH) [Power Unit]: faulty
R93, D22 (1S2473VH) [Tuner]: Open
D21 (RD5R1EB2) [Tuner]: faulty
VDD +B line: Cold soldering/open
Yes
Micro-computers: Normal?
No
*Microcomputer circuit faulty
Yes
Key input circuit faulty
D9 (US1040) [Control Unit]: Open
R137, R138 [Control Unit]: Open
OPEN SW (S20) [Switch Unit (B)]: Poor contact
Key input/output circuit: Cold soldering/open
Door solenoid (SO3: CXP-041): Works?
Yes
Mechanical parts faulty
No
Door lamps (IL1, IL2): Lights through chinks of door?
Yes
Door sensor circuit faulty
Door SW(S26): Cold contact or cold soldering.
Q1 (2SA900) [Volume Unit]: Short
No
PD4050B #18 (DOOR OPEN): H pulse (5V, 150msec)?
Yes
Door solenoid drive circuit faulty
Door solenoid (SO3: CXP-041): Open
Q8 (2SB952) [Control Unit]: Open
Q37 (2SD601) [Control Unit]: Open
D36 (MA151K) [Control Unit]: Open
C63, R153, R155, R201, etc. [Control Unit]: faulty
Drive circuit: Cold soldering/open
No
Q2 (2SC2021F) [Volume Unit]: Short
PD4050B #8: No H pulse

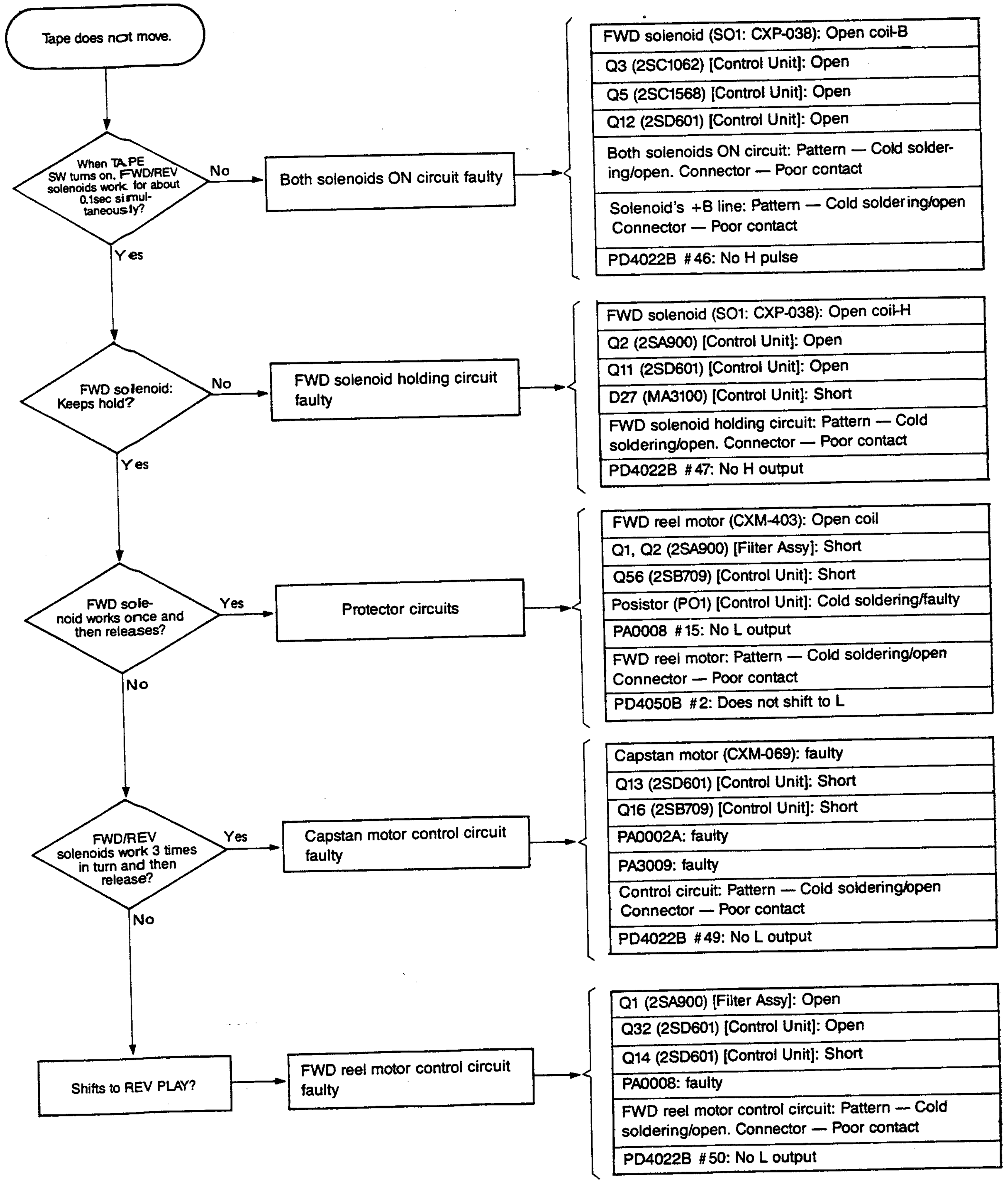
19.3 LOADING (SET) IS INCAPABLE

Loading incapable after inserting a cassette, or it ejects soon after loading.


Loading is incapable.
Ejects soon after loading?
Yes
Cassette SET sensor circuit faulty
CST SET SW (S3): Short
R74, R75 [Control Unit]: Cold soldering/open
PD4022B #30: Cold soldering
R74 ~ PD4022B #30 line: Open
No
PD4022B #30 (CST SET): L(0V)?
No
CST SET SW (S3): Poor contact
P3 ~ PD4022B #30 line: Pattern — Cold soldering
Connectors — Poor contact
Yes
When insert a cassette, PD4022B #28 (CST IN): H(5V)?
No
Cassette IN sensor circuit faulty
CST SET SW (S2): Short
R73, R182 [Control Unit]: Cold soldering/open
C21 [Control Unit]: Short
PD4022B #28: Cold soldering
R73 ~ PD4022B #28 line: Open
Yes
BA6209 #5 (F IN): H(3V)?
No
R81 [Control Unit]: Cold soldering/open
PD4022B #22 ~ BA6209 #5 line: Cold soldering/open
PD4022B #22: No H output
Yes
BA6209 #2 (Vout1): H(8V)?
No
BA6209 #2: No H output
D2 (RD8R2EB2) [Power Unit] faulty
R15 [Power Unit]: Cold soldering/open
Yes
Loading motor (CXC-814) faulty
L. motor: Leads — Cold soldering
Connector — Poor contact
BA6209 #10: Open

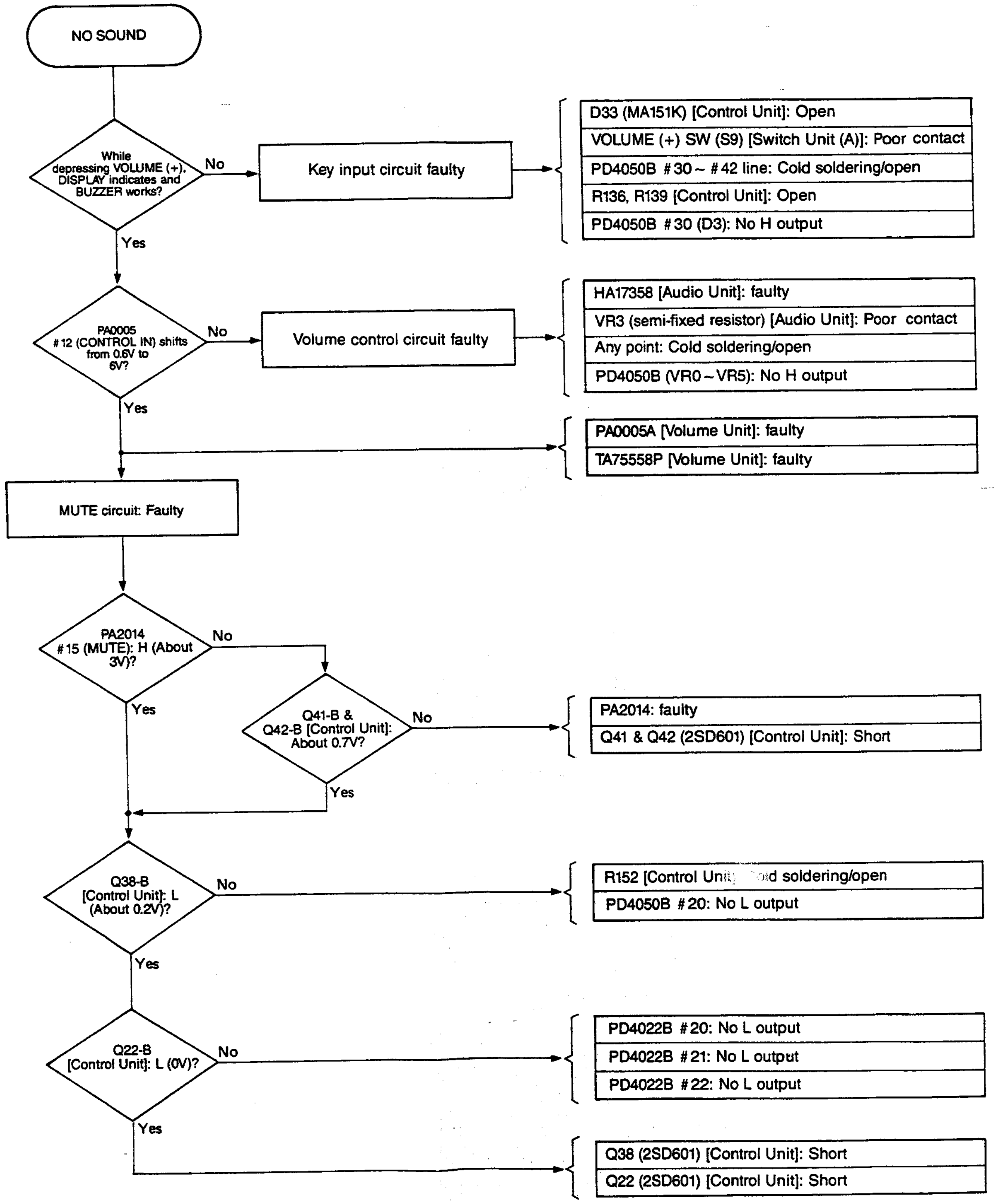
19.4 DECK IS DEAD

Tape does not move (FWD PLAY) after loading.


Tape does not move.
When TAPE SW turns on, FWD/REV solenoids work for about 0.1sec simultaneously?
No
Yes
Both solenoids ON circuit faulty
FWD solenoid (SO1: CXP-038): Open coil-B
Q3 (2SC1062) [Control Unit]: Open
Q5 (2SC1568) [Control Unit]: Open
Q12 (2SD601) [Control Unit]: Open
Both solenoids ON circuit: Pattern — Cold soldering/open. Connector — Poor contact
Solenoid's +B line: Pattern — Cold soldering/open Connector — Poor contact
PD4022B #46: No H pulse
FWD solenoid: Keeps hold?
No
Yes
FWD solenoid holding circuit faulty
FWD solenoid (SO1: CXP-038): Open coil-H
Q2 (2SA900) [Control Unit]: Open
Q11 (2SD601) [Control Unit]: Open
D27 (MA3100) [Control Unit]: Short
FWD solenoid holding circuit: Pattern — Cold soldering/open. Connector — Poor contact
PD4022B #47: No H output
FWD solenoid works once and then releases?
Yes
No
Protector circuits
FWD reel motor (CXM-403): Open coil
Q1, Q2 (2SA900) [Filter Assy]: Short
Q56 (2SB709) [Control Unit]: Short
Posistor (PO1) [Control Unit]: Cold soldering/faulty
PA0008 #15: No L output
FWD reel motor: Pattern — Cold soldering/open Connector — Poor contact
PD4050B #2: Does not shift to L
FWD/REV solenoids work 3 times in turn and then release?
Yes
No
Capstan motor control circuit faulty
Capstan motor (CXM-069): faulty
Q13 (2SD601) [Control Unit]: Short
Q16 (2SB709) [Control Unit]: Short
PA0002A: faulty
PA3009: faulty
Control circuit: Pattern — Cold soldering/open Connector — Poor contact
PD4022B #49: No L output
Shifts to REV PLAY?
FWD reel motor control circuit faulty
Q1 (2SA900) [Filter Assy]: Open
Q32 (2SD601) [Control Unit]: Open
Q14 (2SD601) [Control Unit]: Short
PA0008: faulty
FWD reel motor control circuit: Pattern — Cold soldering/open. Connector — Poor contact
PD4022B #50: No L output

19.5 NO SOUND

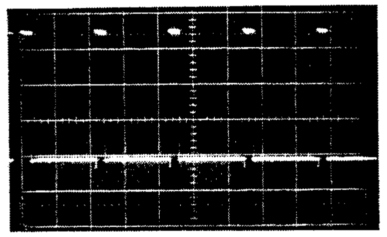
Deck and Tuner are OK (displays normally), but no sound on R & L channels.


NO SOUND
While depressing VOLUME (+), DISPLAY indicates and BUZZER works?
No
Yes
Key input circuit faulty
D33 (MA151K) [Control Unit]: Open
VOLUME (+) SW (S9) [Switch Unit (A)]: Poor contact
PD4050B #30 ~ #42 line: Cold soldering/open
R136, R139 [Control Unit]: Open
PD4050B #30 (D3): No H output
PA0005 #12 (CONTROL IN) shifts from 0.6V to 6V?
No
Yes
Volume control circuit faulty
HA17358 [Audio Unit]: faulty
VR3 (semi-fixed resistor) [Audio Unit]: Poor contact
Any point: Cold soldering/open
PD4050B (VR0 ~ VR5): No H output
PA0005A [Volume Unit]: faulty
TA75558P [Volume Unit]: faulty
MUTE circuit: Faulty
PA2014 #15 (MUTE): H (About 3V)?
No
Yes
Q41-B & Q42-B [Control Unit]: About 0.7V?
No
Yes
PA2014: faulty
Q41 & Q42 (2SD601) [Control Unit]: Short
Q38-B [Control Unit]: L (About 0.2V)?
No
Yes
R152 [Control Unit]: Cold soldering/open
PD4050B #20: No L output
Q22-B [Control Unit]: L (0V)?
No
Yes
PD4022B #20: No L output
PD4022B #21: No L output
PD4022B #22: No L output
Q38 (2SD601) [Control Unit]: Short
Q22 (2SD601) [Control Unit]: Short

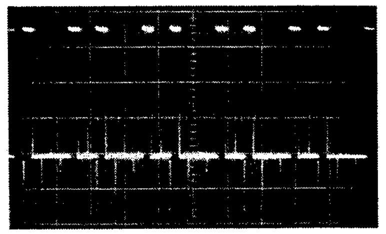
19.6 DISPLAYS ARE DEAD.

Tuner and Deck are normal except FL (Tape's movement, Frequency, etc.) and LED (Function of TAPE/TUNER) indication.

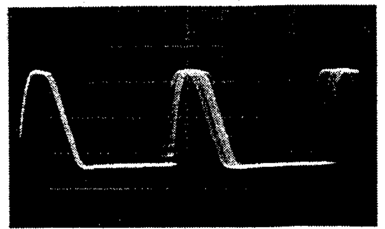
H:2mS/div
V:10V/div



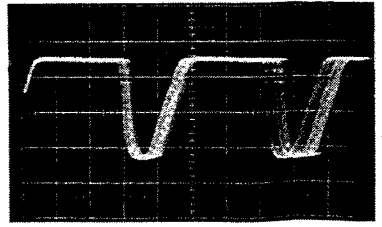
H:2mS/div
V:10V/div

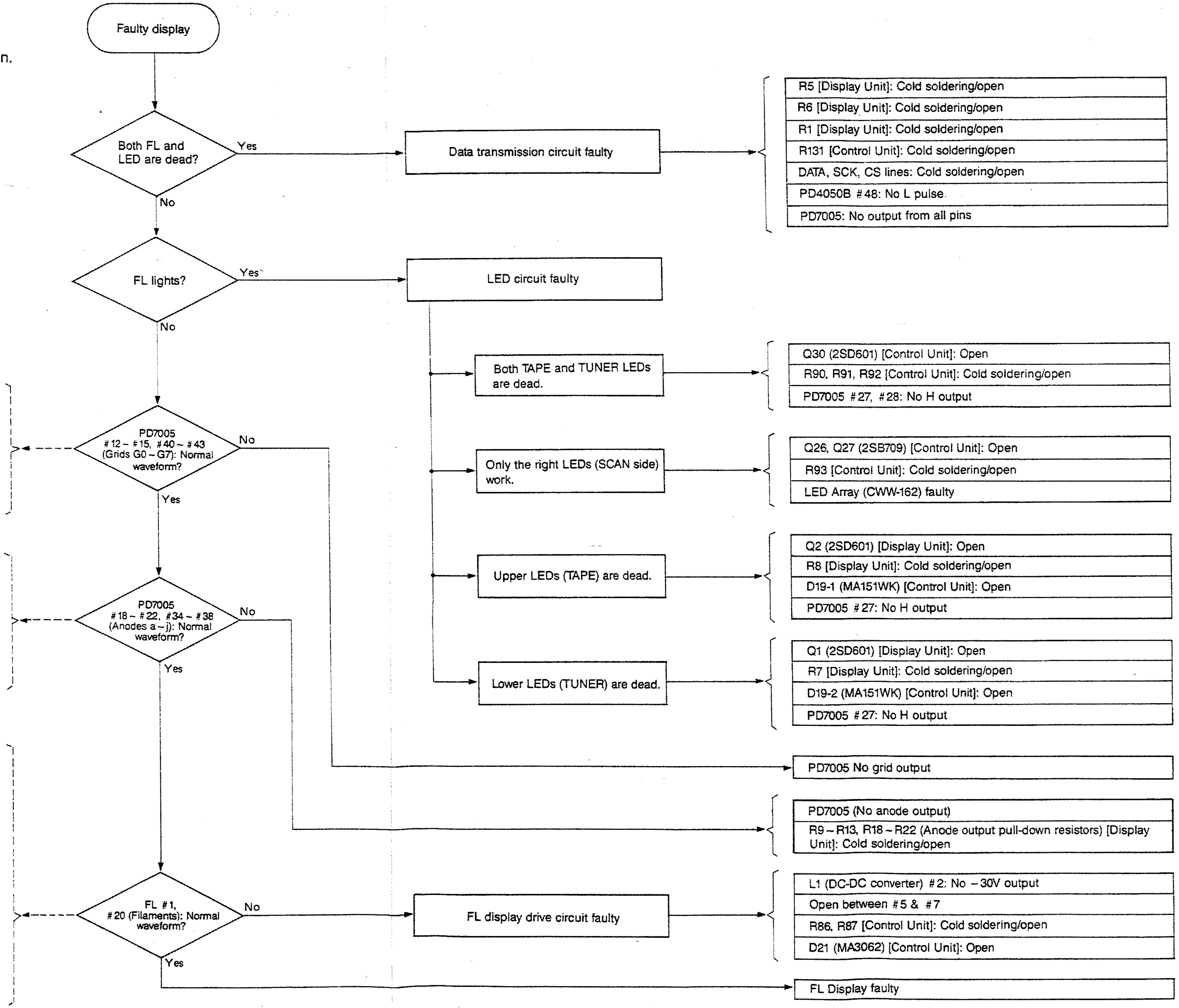


H:1μS/div
V:2V/div



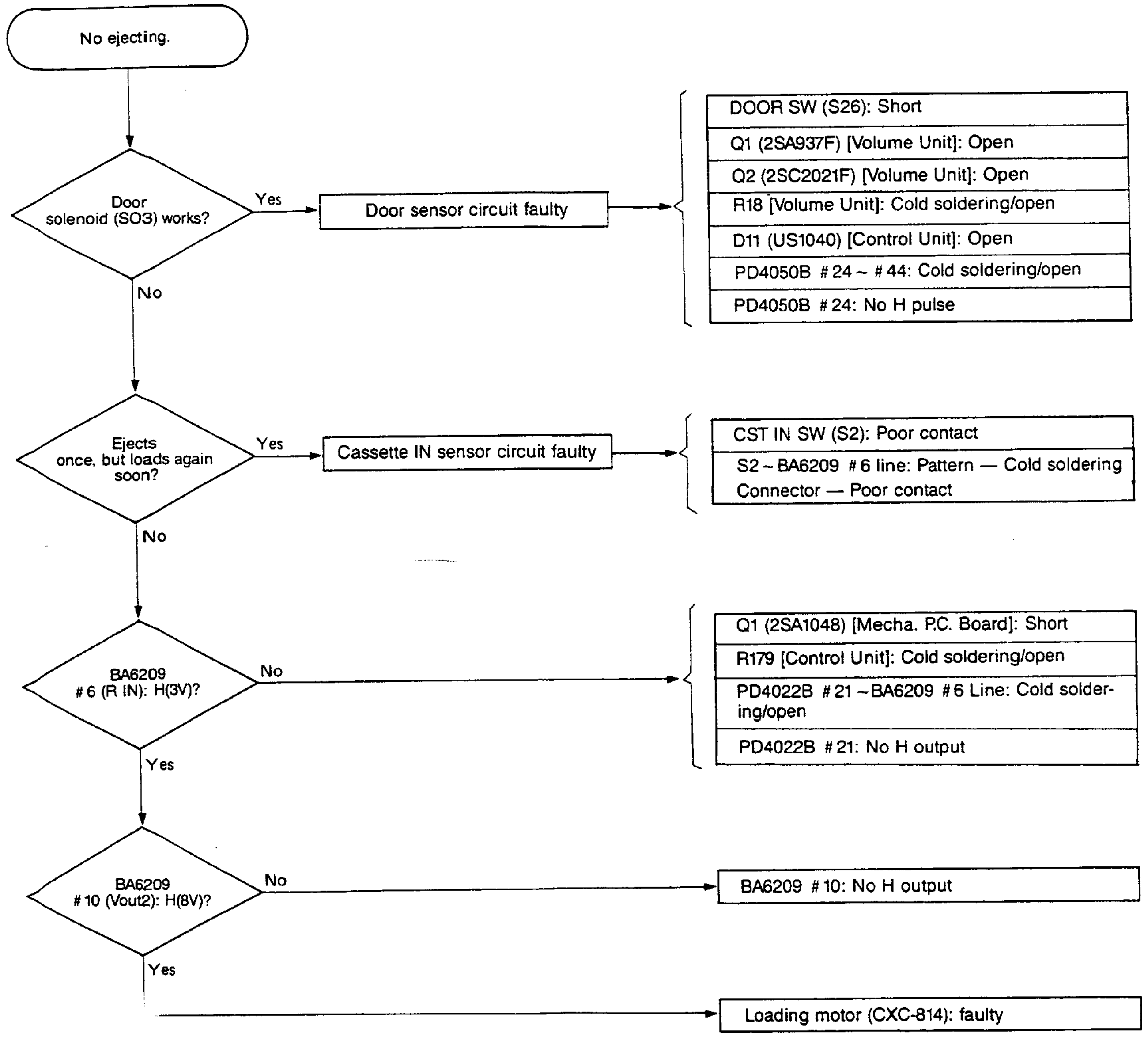
H:1μS/div
V:2V/div




Faulty display
Both FL and LED are dead?
Yes
Data transmission circuit faulty
R5 [Display Unit]: Cold soldering/open
R6 [Display Unit]: Cold soldering/open
R1 [Display Unit]: Cold soldering/open
R131 [Control Unit]: Cold soldering/open
DATA, SCK, CS lines: Cold soldering/open
PD4050B #48: No L pulse
PD7005: No output from all pins
No
FL lights?
Yes
LED circuit faulty
Both TAPE and TUNER LEDs are dead.
Q30 (2SD601) [Control Unit]: Open
R90, R91, R92 [Control Unit]: Cold soldering/open
PD7005 #27, #28: No H output
Only the right LEDs (SCAN side) work.
Q26, Q27 (2SB709) [Control Unit]: Open
R93 [Control Unit]: Cold soldering/open
LED Array (CWW-162) faulty
Upper LEDs (TAPE) are dead.
Q2 (2SD601) [Display Unit]: Open
R8 [Display Unit]: Cold soldering/open
D19-1 (MA151WK) [Control Unit]: Open
PD7005 #27: No H output
Lower LEDs (TUNER) are dead.
Q1 (2SD601) [Display Unit]: Open
R7 [Display Unit]: Cold soldering/open
D19-2 (MA151WK) [Control Unit]: Open
PD7005 #27: No H output
No
PD7005 #12 ~ #15, #40 ~ #43 (Grids G0 ~ G7): Normal waveform?
No
PD7005 No grid output
Yes
PD7005 #18 ~ #22, #34 ~ #38 (Anodes a ~ j): Normal waveform?
No
PD7005 (No anode output)
R9 ~ R13, R18 ~ R22 (Anode output pull-down resistors) [Display Unit]: Cold soldering/open
Yes
FL #1, #20 (Filaments): Normal waveform?
No
FL display drive circuit faulty
L1 (DC-DC converter) #2: No –30V output
Open between #5 & #7
R86, R87 [Control Unit]: Cold soldering/open
D21 (MA3062) [Control Unit]: Open
Yes
FL Display faulty

19.7 EJECTING IS INCAPABLE.

Loading is possible, but not ejecting.


No ejecting.
Door solenoid (SO3) works?
Yes
Door sensor circuit faulty
DOOR SW (S26): Short
Q1 (2SA937F) [Volume Unit]: Open
Q2 (2SC2021F) [Volume Unit]: Open
R18 [Volume Unit]: Cold soldering/open
D11 (US1040) [Control Unit]: Open
PD4050B # 24 ~ # 44: Cold soldering/open
PD4050B # 24: No H pulse
No
Ejects once, but loads again soon?
Yes
Cassette IN sensor circuit faulty
CST IN SW (S2): Poor contact
S2 ~ BA6209 # 6 line: Pattern — Cold soldering
Connector — Poor contact
No
BA6209 # 6 (R IN): H(3V)?
No
Q1 (2SA1048) [Mecha. P.C. Board]: Short
R179 [Control Unit]: Cold soldering/open
PD4022B # 21 ~ BA6209 # 6 Line: Cold soldering/open
PD4022B # 21: No H output
Yes
BA6209 # 10 (Vout2): H(8V)?
No
BA6209 # 10: No H output
Yes
Loading motor (CXC-814): faulty